

Indicative Feasibility Study

Avebury Mining and Processing Options

Prepared for

Allegiance Mining NL

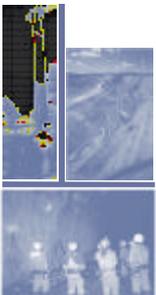
Prepared by

Gary R Davison

BFP Consultants Pty Ltd
1/21 Howleys Road
Notting Hill Vic 3168

Tel: +613 9562 7111
Fax: +613 9562 7133
Email: mail@bfp.com.au
Web Site: www.bfp.com.au

DATE: 26 September 2003
JOB NO. 1203014



DOCUMENT INFORMATION

Status	Final
Version	1_
Print Date	6 October, 2003
Approval State	Approved
Author(s)	Gary Davison
Reviewed By	Don Miller
Pathname	X:\12_Melbourne Mining\1203014 Avebury IFS\24-9-03
File Name	Rpt_1_0_Avebury_IFS_Final.doc
Job No	1203014
Distribution	

DOCUMENT CHANGE CONTROL

Version	Date	Author (s)	Date Issued
0_1	16 Sept. 2001	Gary Davison	26 September 2003
1_0	26 Sept. 2003	Gary Davison	26 September 2003

DOCUMENT REVIEW AND SIGN OFF

Name	Position		Signature	Date Issued
Don Miller	Director	Reviewer		
Gary Davison	Manager, Mining	Author		

Table Of Contents

EXECUTIVE SUMMARY	1
1.0 INTRODUCTION	4
2.0 TENURE AND PERMITTING PROCESSES	6
3.0 FURTHER EXAMINATION	9
4.0 GEOLOGICAL SETTING AND MINERAL RESOURCES	10
4.1 Geological Setting	10
4.2 Identified Mineral Resources	11
4.3 Resource Potential	15
5.0 DEVELOPMENT STRATEGY	17
6.0 STAGE 1 DEVELOPMENT	19
6.1 Existing Infrastructure	19
6.2 Stage 1 (Viking Decline) Infrastructure Requirements.....	20
6.2.1 Access road.....	21
6.2.2 Support facilities	21
6.2.3 Power supply.....	23
6.2.4 Supervision and management.....	24
6.2.5 Stage 1 Infrastructure Cost Summary.....	24
6.2.6 Decline	24
6.2.7 Other studies/ Geological Drilling/ Management/ Finance Estimate.....	25
7.0 UPGRADES FOR RENISON TREATMENT OPTION	26
7.1 Infrastructure	26
7.1.1 Ore transport	26
7.1.2 Site services and facilities	27
7.2 On-site Treatment-Infrastructure Requirements	27
7.2.1 Access road.....	27
7.2.2 Power supply.....	28
7.2.3 Site facilities	28
8.0 MINING DEVELOPMENT	28
8.1 Stage 1 Development	28
8.2 Development Schedule	31
8.2.1 Stage 1	31
8.2.2 Total Mine.....	32
8.3 Geotechnical	34
8.4 Costs	34
8.5 Development Capital Costs	35
8.5.1 Stage 1 – Exploration Decline.....	35
8.5.2 Pre-Production Development	35
9.0 MINE PRODUCTION	35
9.1 Description.....	35
9.2 Production Schedule.....	36
9.3 Construction Schedule	38
9.4 Geotechnical	41
9.4.1 Transverse stopes.....	41
9.4.2 Southern, Northern Flank Stopes and Nth Avebury.....	42
9.5 Mining Methods	43

9.5.1	Upper saddle	43
9.5.2	Southern, Northern flanks and Nth Avebury	43
9.6	Production	43
9.6.1	Production Rate	43
9.6.2	Production Methods	44
9.7	Filling	46
9.8	Costs	46
9.8.1	Overhead costs	46
9.8.2	Mine Operating Costs	48
10.0	MINE CAPITAL EQUIPMENT COSTS	48
11.0	METALLURGY AND MILLING	49
11.1	Summary	49
11.2	Avebury Mineralogy	50
11.3	Metallurgical Test Work	50
11.3.1	Metcon testwork	50
11.3.2	Western Metals testwork	52
11.4	Renison Testwork	52
11.5	Processing	53
11.6	Avebury (on-site) Mill	53
11.7	Renison Mill	57
11.8	Concentrate Transport	61
12.0	CONCENTRATE MARKETING	62
12.1	Indicative smelter terms	63
12.2	Off-take Agreement	63
13.0	ENVIRONMENTAL MANAGEMENT	63
13.1	Avebury Environmental Setting	63
13.2	Environmental Policy & Strategic Management	64
13.3	Environmental Approvals Process	65
13.3.1	Permitting for Stage 1 decline development	65
13.3.2	Environmental Management of Stage 1	66
13.3.3	Permitting for Stage 2 (Production) Development	66
13.3.4	Environmental Management of Stage 2 (Production)	67
14.0	FINANCIAL ANALYSIS	68
14.1	Summary	68
14.2	Model Assumptions	72
14.2.1	Mineral Resources	73
14.2.2	Metal Prices and Exchange Rates	73
14.2.3	Metallurgy, Smelter Charges and Penalties	73
14.2.4	Concentrate Transport and Freight	74
14.2.5	Capital Costs	74
14.2.6	Operating Costs	76
14.3	Economic Models	77
15.0	SUMMARY OF ASSUMPTIONS	85
15.1	Geology	85
15.2	Stage 1, Exploration Decline	85
15.3	Mining	85
15.4	Milling	85
15.5	Financial	85
16.0	REFERENCES	86

EXECUTIVE SUMMARY

BFP have been requested by Allegiance Mining to prepare a study to “Indicative Feasibility Level” to determine the economic viability of the project.

BFP has developed an access and mining plan for the deposit based on the geological interpretation provided by Newnham Exploration.

In addition Allegiance has provided:

- geotechnical information from previous reports,
- metallurgical information including information on recovery, capital and operating costs, and
- indicative smelter terms gained specifically from prospective smelters.

Allegiance Mining NL. has identified a nickel sulfide deposit at Avebury in Western Tasmania estimated to contain 4 Mt 1.5% Ni. Details below.

Deposit	Resource Tonnes	Grade (% Ni)	Cut Off (% Ni)	Cont Ni (t)
<u>Indicated Mineral Resource</u>				
North Avebury	1,260,000	1.5	0.8	18,900
Viking (*)	1,880,000	1.5	1.0	28,200
Sub-Total	3,140,000	1.5		47,100
<u>Inferred Mineral Resource</u>				
North Avebury	200,000	1.8	0.8	3,600
Viking (*)	720,000	1.5	1.0	10,800
Sub-Total	920,000	1.6		14,400
<u>Total Mineral Resource</u>				
North Avebury	1,460,000	(**)1.5	0.8	22,500
Viking (*)	2,600,000	1.5	1.0	39,000
TOTAL	4,060,000	1.5		61,500

- Mineralisation, which is developed along the flanks of an altered ultramafic host rock in two fault offset bodies named North Avebury and Viking, has been defined by 40 cored drill holes over a strike length of 500 metres and to a depth of 400 metres.
- Allegiance has expended approximately \$5.5 million on the project to date. Allegiance believe that their exploration studies suggest the district is highly prospective for the discovery of additional resources along strike to the east and west of Avebury.
- Mineralogical and metallurgical studies indicate Avebury mineralisation, which is dominated by coarse pentlandite associated with abundant magnetite and minor pyrrhotite, pyrite and nickel arsenides, will be amenable to low cost, conventional milling, with approximately 87% of the nickel being recovered into 20-22% Ni concentrates.
- To facilitate the detailed underground evaluation and financial assessment of Avebury, Allegiance has applied for a Mining Lease over the deposit, and submitted a Development Application accompanied by a Development Proposal and Environment Management Plan, to both Local and State Governments.

- Using geotechnical information from gained from a specific decline investigation hole, it appears that access can be gained to the Viking and Nth. Avebury orebodies without excessive ground reinforcement.
- Using limited geotechnical information from previous studies it appears that stoping , can be undertaken at a reasonable cost.
- A mine design utilising contractors will enable a mine producing approx. 400,000 tpa at a grade of 1.4% Ni. For approx. 10 years.
- An exploration decline and of approx 1062m is envisaged. With associated development / infrastructure / geological drilling/ geotechnical examination and technical studies an estimate for this stage 1 work is \$7.3M
- The following development is required to exploit this resource:-

Total Development	metres
Stage 1 Exploration Decline and associated crosscuts	1,244
Declines	5,256
Vent / Escape ways	1,800
4m X4m, ore development	13,485
Crosscuts to orebody / connection to vent etc.	1,800

After evaluating a range of different options including ore treatment on site, toll treatment at Hellyer and/or Renison and a Cashflow Sharing Option with the Renison Mine, it was decided, by BFP and Allegiance, to concentrate on the "Mill at Site" and the Renison "Cashflow Sharing Option":

Based on the assumptions detailed in Section 13 – Financial Analysis, these two options have the potential to give the following rates of return, see table below.

Both options are considered after the Stage 1, Exploration Decline and infrastructure, has been completed.

Summary of Preferred Options

Nickel Price \$US8950/t, Exchange Rate: A\$:US\$, 0.66

Option	MTPA	Grade (avg)	Pre Prod Capital	Pre Tax NPV@8%	IRR	Max Neg Cash	Total Cost (Inc smelt)
		% Ni	\$M	\$M	%	\$M	US\$/lb
Mill at Site	0.4	1.4	29.8	69	52	32.4	2.31
Mill at Renison 90:10 split	0.4	1.4	4.8	74	240	5.6	2.44

The Pre-Tax NPV@ 8% is higher for the “Mill at Renison” case, \$69Million against \$74Million for Renison “Cash Flow Sharing Option”, 90:10 split (CFSO). The Renison CFSO option provides a higher rate of return of 240% against 52% due to the significantly lower capital requirement.

The cost of the Stage 1, Exploration Decline (\$7.3M), is considered as Risk Capital and therefore not part of the economic evaluation above. Spreadsheets have however been constructed with these costs included should they be required for examination. They effectively show corresponding changes to both maximum capital draw-down and overall NPVs.

The Renison option lowers the capital investment and therefore risk, however this can only occur if a suitable financial arrangement can be made with the owners of Renison milling facility.

The capital required for the Mill on Site option is approx. \$32.4M

The capital required for the Mill at Renison option is approx. \$5.5M

The rates of return, above, justify further investigation of the Avebury nickel project. One avenue for investigation is the implementation “Stage 1” of the project. This involves developing an underground access (exploration decline) into the upper high grade section of Viking (Avebury South). This would facilitate both a detailed technical evaluation of Viking and parts of North Avebury, including further diamond drilling, and provide an accelerated platform for early production.

1.0 INTRODUCTION

The Avebury nickel sulphide deposit lies within the western Tasmanian metallogenic province, renowned for the abundance and diversity of its mineral deposits, several of which are regarded as world class.

The Avebury area has been subjected to several phases of modern exploration by a variety of organisations, including nickel exploration in the late 1960s-early 70's, tin during the 1970s and 80s, and zinc in the early 90s.

It was during the zinc exploration phase in the 1990s that CRA Exploration (now Rio Tinto Exploration), in joint venture with Allegiance, identified an intense magnetic anomaly at Avebury. CRA drilled three cored holes into this anomaly and intersected significant nickel sulphides in altered ultramafic rocks, immediately east of the current Avebury resource area.

In 1997 Allegiance re-negotiated the joint venture agreement with RTE, and became the manager and major partner in the project. They continued to explore the district with geological, geochemical, geophysical and core drilling programs.

The early drilling results at Avebury identified a significant deposit of non-outcropping nickel sulfide mineralisation known as North Avebury, developed along the margins of an ultramafic body.

In 2001 on the basis of results from this initial drilling, supported by appropriate mining, metallurgical and marketing studies, a Scoping Study (Reference 1) was completed on the underground development of North Avebury. This Scoping Study indicated that the known resource should be commercially capable of supporting a 300,000 tpa underground operation, processing ore through an on-site mill over a 10-year period.

Subsequent financial modeling on the results of the Scoping Study highlighted that the project would be more commercially robust if the resource could be increased, thereby supporting a higher throughput operation.

With the objective of defining additional resources, further drilling was undertaken through 2002. This drilling identified the Viking deposit, previously known as South Avebury, lying to the immediate south-west of North Avebury.

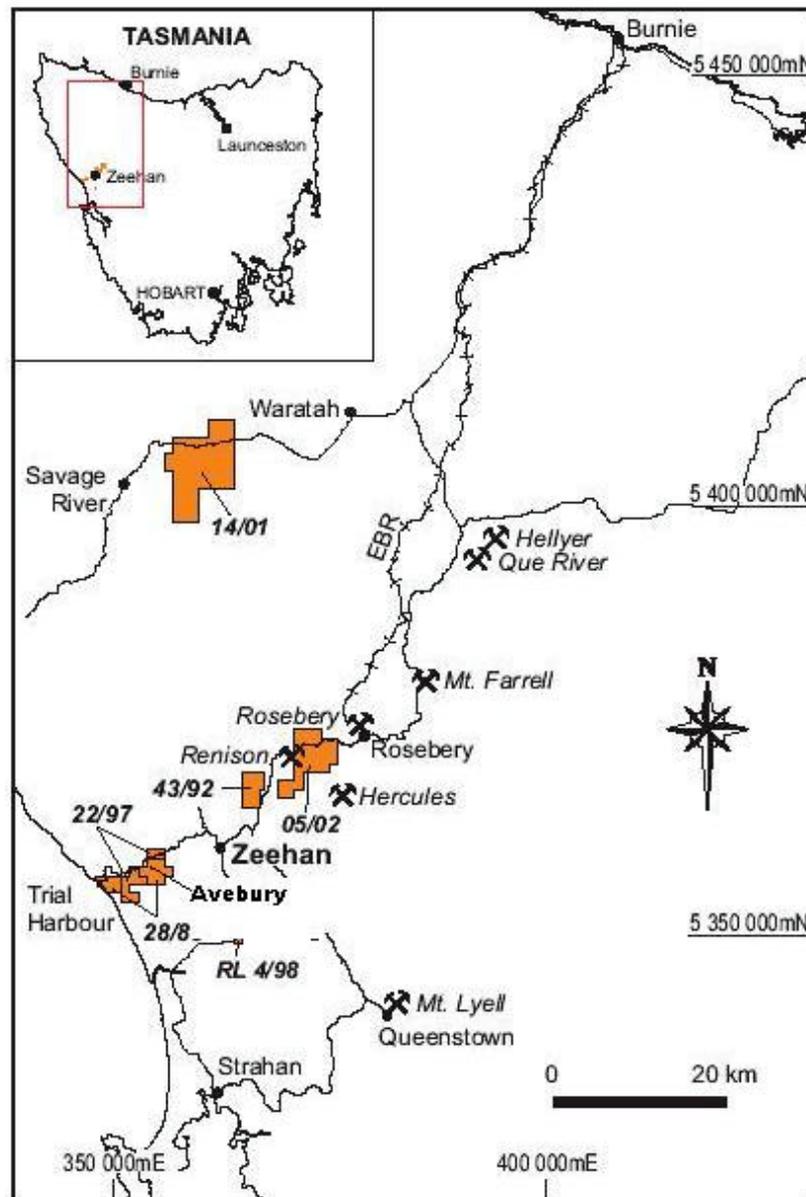
Whilst work during this period was largely focused on the Avebury deposit, other drilling programs were completed in the district by Allegiance, and were successful in identifying additional nickel deposits along strike to the east and west of Avebury at East Avebury and Burbank respectively.

Since completion of the Scoping Study in 2001, not only has the size, technical knowledge and understanding of the potential of Avebury increased, but also a number of unrelated events have emerged at nearby mining operations which present Allegiance with potential alternative development and processing options for Avebury ore.

This Indicative Feasibility Study quantifies the commercial viability of developing the Avebury nickel sulfide deposits in the context of both the current knowledge of the resource and evolving processing opportunities in the district.

The study is undertaken at the Indicative Feasibility Study level, which reflects the professionally assessed level of currently available mineral resource, geotechnical, metallurgical and marketing data. The level of accuracy for estimates made in this study, unless stated otherwise, are +/- 25%.
A list of assumption are shown in Chapter 15.

Figure 1.1 - Location Plan



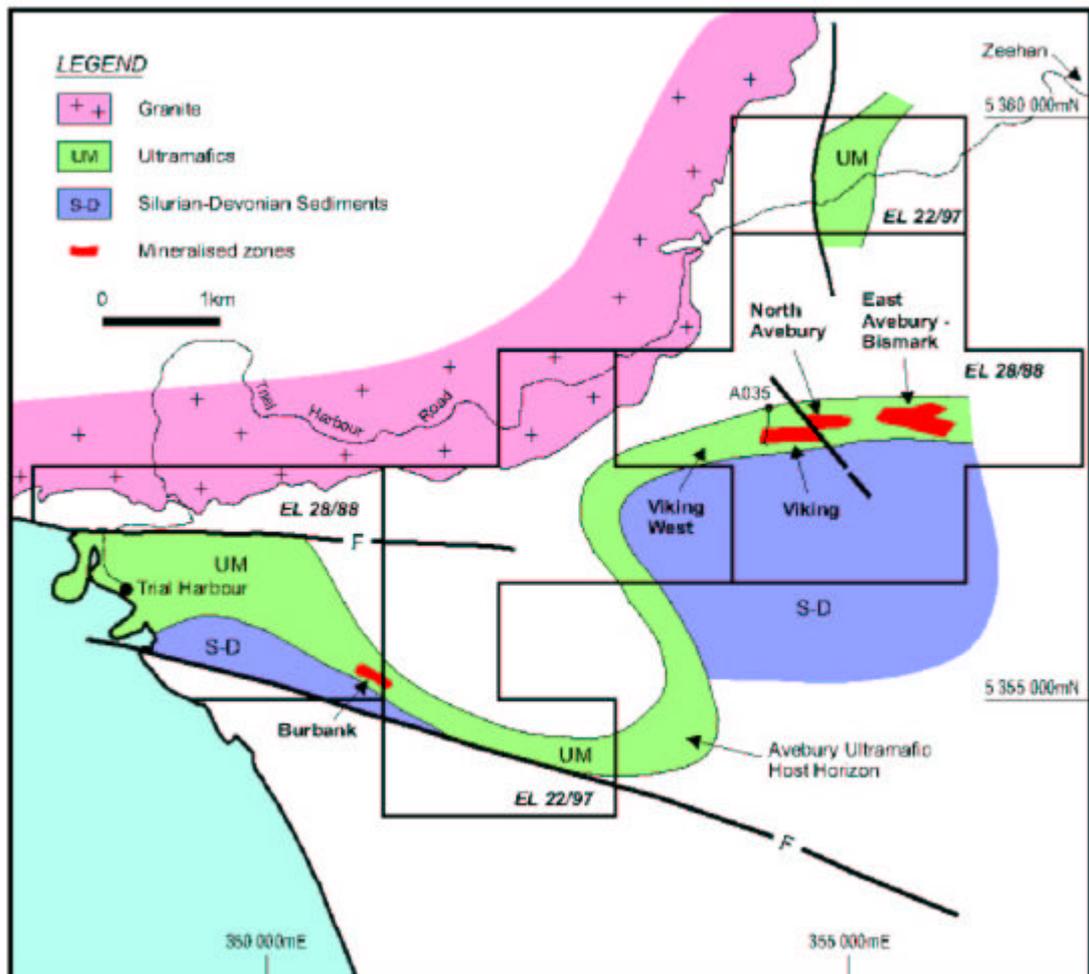
2.0 TENURE AND PERMITTING PROCESSES

Allegiance Mining NL is the beneficial holder of Exploration Licence 28/1988 of 13 sq km in two parts. This licence covers the Avebury deposit as currently known, the Burbank deposit to the west of Avebury and the East Avebury deposit to the east. The licence has been renewed to 09 December 2003, and will be subject to application for extension beyond that date.

The area between Avebury and Burbank and to the north of Avebury is also held by Allegiance under EL 22/1997. This licence expires on 29 August 2003 and application was submitted to Mineral Resources Tasmania on 4 August 2003 for extension beyond that date.

The locations of these ELs are shown in Figure 2.1 below.

Figure 2.1 - Tenement Locations and District Geology



Under agreement between Allegiance and Rio Tinto Exploration production sales from these tenements, or any tenement granted in substitute of these tenements, is subject to a 2% royalty payable to RTE.

The ELs cover land classified as Multiple Use State Forest, managed by Forestry Tasmania, and lying within the municipality of the West Coast Council.

According to Allegiance, their strategic plan is to advance the Avebury project to a definitive/bankable feasibility study level by the integrated development of an underground decline and associated detailed environmental and technical studies

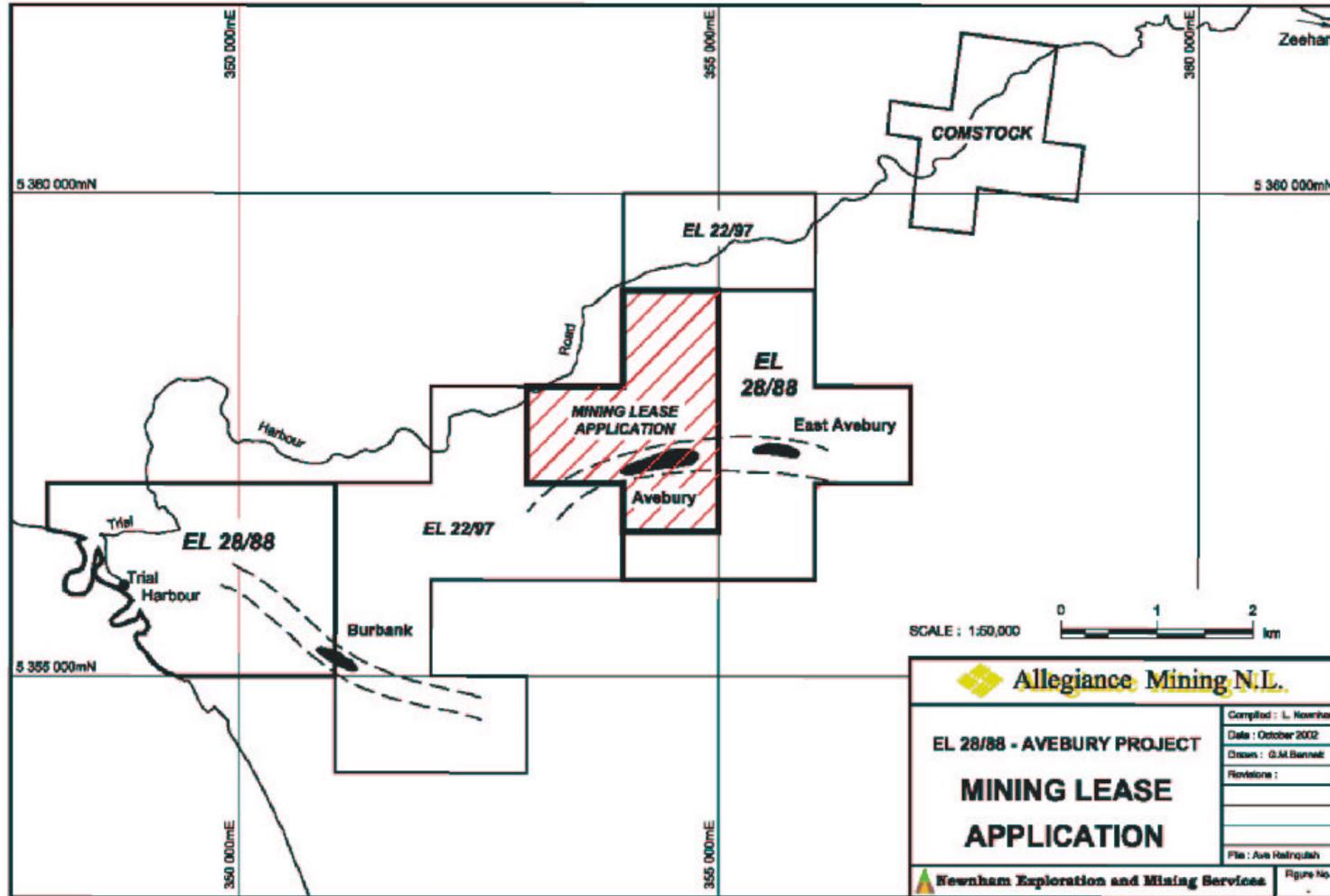
In Tasmania, this work is classified by Government as a Level 2 development activity. A Level 2 activity requires approval of both the State Government and the relevant local council. Before development can commence, Allegiance must have:

- a Mining Lease issued by Mineral Resources Tasmania
- a land use permit from the West Coast Council issued in conjunction with the State Government

On 02 May 2003 Allegiance applied to Mineral Resources Tasmania for a 400ha mining lease over the Avebury resource to facilitate on-going assessment and development of the deposit. Mining Lease Application 3M/2003 is currently being processed by MRT. An agreed \$120,000 environmental and performance bond is required ahead of issue of the lease.

The location of MLA 3M/2003 is shown on Figure 2.2. The MLA area was designed to adequately cover the known Avebury resource, potential strike and depth extensions of that resource and anticipated development infrastructure requirements.

Figure 2.2 - Mining Lease Application



A land use permit development application was submitted by Allegiance to the West Coast Council on 26 June 2003. This application was supported by a comprehensive report titled:

*“Avebury Nickel Project, Stage 1, Viking Decline Development. Development Proposal and Environmental Management Plan (DPEMP)”
(Reference 2)*

This report, dated June 2003, was prepared for Allegiance by NSR Environmental Consultants Pty Ltd, in accordance with comprehensive guidelines issued by the Department of Primary Industries, Water and Environment (DPIWE) and incorporating requirements from other government departments.

The development application also carried the consent (subject to conditions) of Forestry Tasmania as land owners of the area.

The application must now work its way through a statutory and formalised approval process before the permit can be issued. This process is estimated to take 3-4 months to complete.

Before Allegiance can progress Avebury from the bankable feasibility study stage through to the full mine production stage, this process will have to be repeated, and this has been detailed in schedules and budgets in the Stage 1 Viking Decline Development Business Plan.

3.0 FURTHER EXAMINATION

To examine the project in further detail BFP have investigated two production scenarios.

1. Ore treatment at the Renison concentrator,
2. Ore treatment on site.

In specific terms, BFP has been requested to examine:

- Mining methods
- Development requirements
- Beneficiation Options
- Associated timeframes and costs

The information developed in BFP's May 2003 Stage 1 report (Reference 3), Avebury Nickel Project, Stage 1, Viking Decline Development Business Plan is used as base information for this report. This report effectively covers the three stages outlined in the above mentioned document.

Mr. Gary Davison of BFP visited the Avebury site to assist in the compilation of a business plan. This information gathered during this visit will be used in the compilation of this report.

4.0 GEOLOGICAL SETTING AND MINERAL RESOURCES

4.1 Geological Setting

The Avebury nickel sulfide deposit is a nickel skarn occurrence developed within the contact aureole of the Heemskirk Granite.

The deposit is hosted by a unit of mafic and ultramafic rocks developed within a formation of Cambrian sediments and mafic igneous members.

This package of rocks has been folded into an east-west trending anticline and disrupted by several transverse faults. A major east-west structure has faulted a sequence of younger sediments against the Cambrian formations to the south of Avebury (see Figure 4.1).

The underlying intrusion of the Heemskirk Granite (depth uncertain) has resulted in the intense alteration of both the mineralised host rocks and the enclosing country rocks.

The host ultramafic rocks have been altered to dark green-black serpentinites and the mafic members to tremolite-actinolite-talc-epidote skarns. The country rocks have been strongly hornfelsed. Both the host and country rocks have been affected by pervasive iron-boron metasomatism.

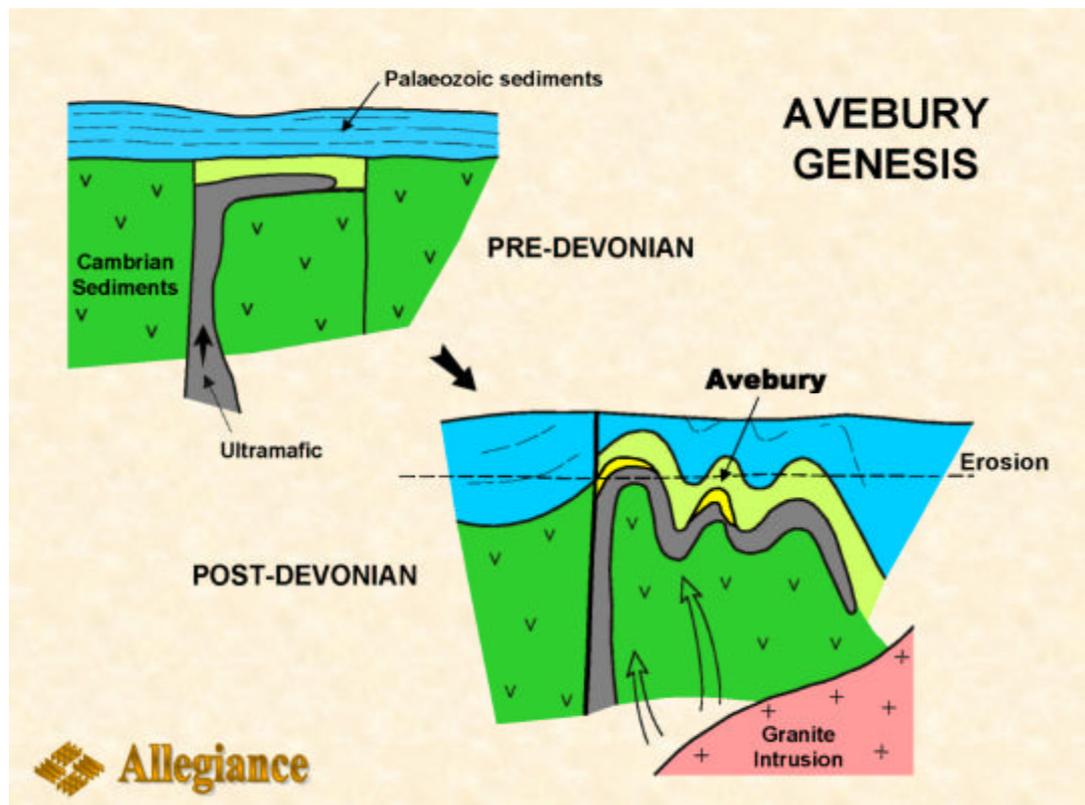
The current genetic theory on the formation of the Avebury mineralisation envisages the Heemskirk Granite introducing large volumes of iron and heat accompanied by minor sulfur into the mafic-ultramafic hosts. This metasomatic event mobilised minor nickel mineralisation within the host rocks, then transported this material along the flanks of the ultramafic-mafic host where it was trapped, concentrated and deposited against the siliceous hornfelsed country rocks (see Figure 4.1).

The mineralisation is dominated by magnetite and coarse pentlandite, accompanied by minor pyrrhotite and minor nickel arsenide minerals, such as nicolite, gersdorffite and safflorite.

Extensive mineralogical studies on drill cores by Central Mineralogical Services suggest there were 2-3 phases of magnetite development, and possibly 2 phases of nickel sulfide emplacement. An early phase of magnetite development is not accompanied by extensive sulfides, and the sulfide emplacement events are not always accompanied by magnetite. In general, the mineralised system is sulfur poor and iron rich, with the dominant sulfide being pentlandite.

The above described mineralogical associations make Avebury a rather unusual deposit and have very important metallurgical implications (See Section 10 below).

Figure 4.1 – Avebury Genesis



4.2 Identified Mineral Resources

The Avebury deposit has been defined by 40 drill holes totaling approximately 15,000 m, completed over a six-year period (Figures 4.2 and 4.3).

Mineralisation has been identified over a 500 m strike length and to a depth of 400 m. It is dominated by coarse pentlandite associated with magnetite and is draped along the axis and flanks of an east-west trending, west plunging, anticline of altered ultramafics.

The ultramafic on the east side of this fault has been displaced to the north. Mineralisation developed on the north and south flanks of this segment of ultramafic have been named **North Avebury** and **Central Avebury** respectively.

The ultramafic on the west side of the fault has been displaced to the south and dropped down relative to the northern ultramafic. Mineralisation developed on the north and south flanks of this segment of ultramafic have been named North Viking and South Viking respectively.

The tops of Viking and North Avebury mineralisation are approximately 100 m and 50 m respectively below surface and they appear to plunge at a shallow angle to the west.

Figure 4.2 - Typical Infill Drill Section

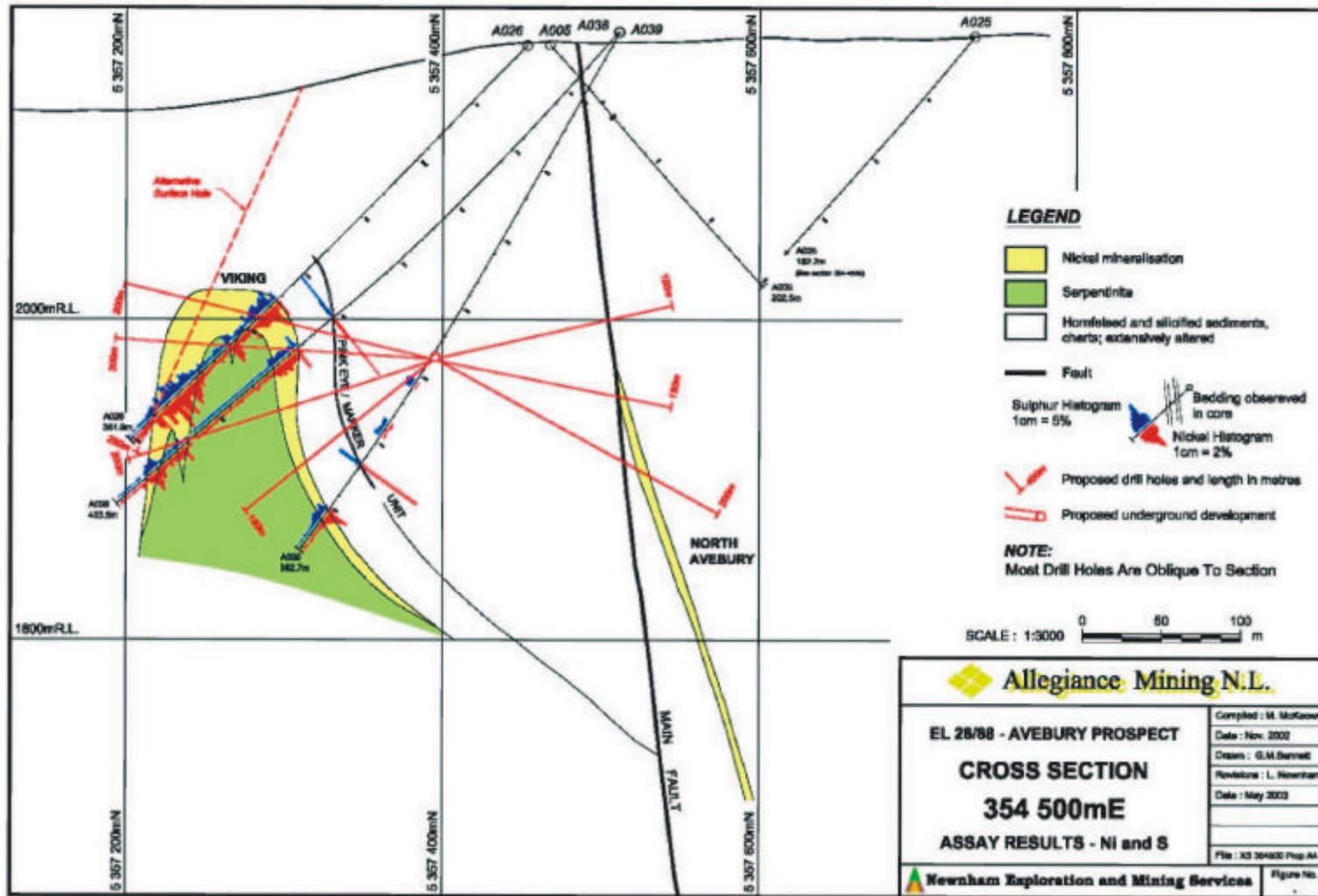
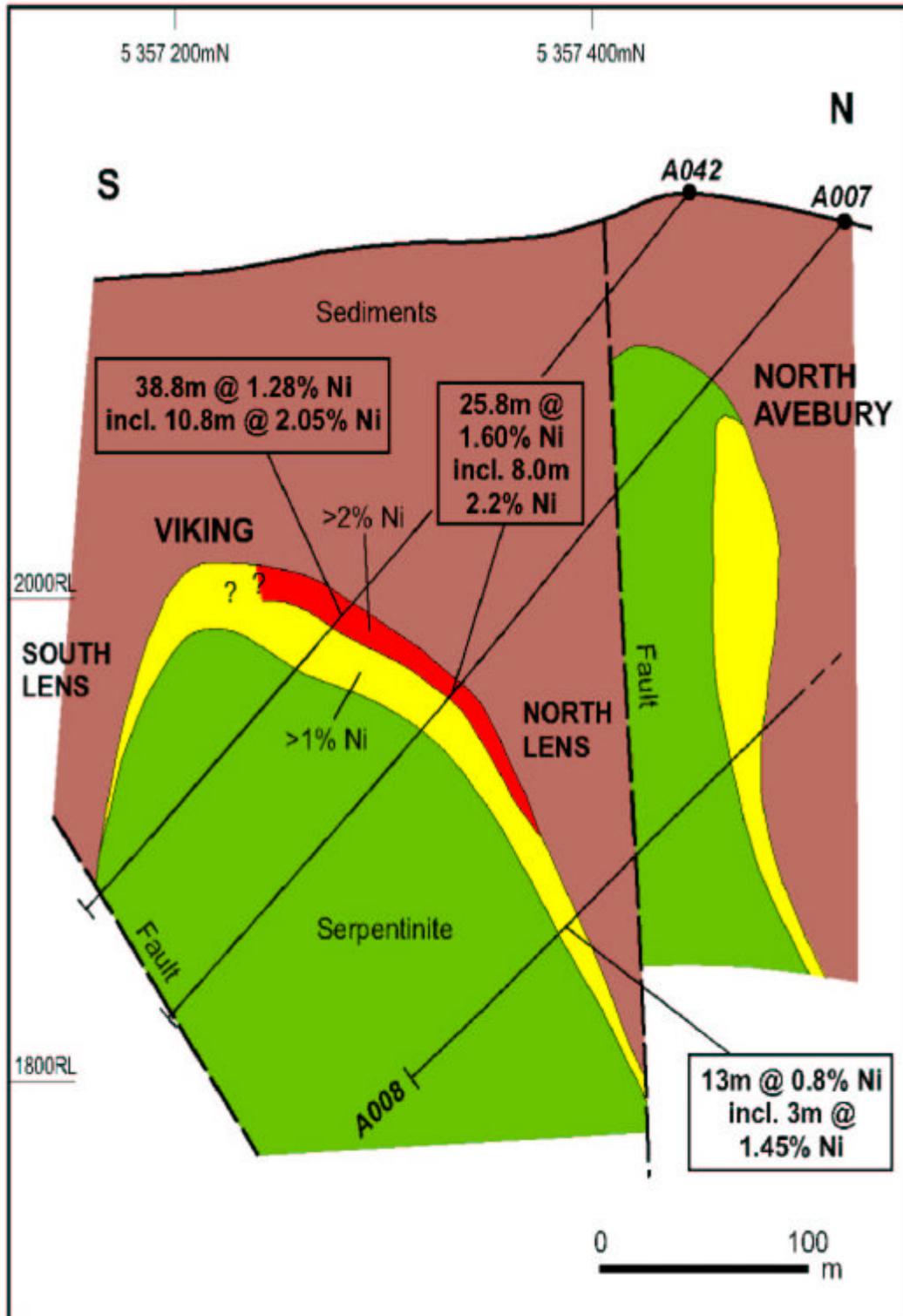


Figure 4.3 - Interpretive Cross Section - High Grade Zone



Avebury Project - Section 354 600mE - Higher Grade Upper Viking Resource

The Avebury deposit has been estimated by geostatistical and classical methods to contain identified mineral resources as shown in Table 4.1.

Table 4.1 – Mineral Resource

Deposit	Resource Tonnes	Grade (% Ni)	Cut Off (% Ni)	Cont Ni (t)
Indicated Mineral Resource				
North Avebury	1,260,000	1.5	0.8	18,900
Viking (*)	1,880,000	1.5	1.0	28,200
Sub-Total	3,140,000	1.5		47,100
Inferred Mineral Resource				
North Avebury	200,000	1.8	0.8	3,600
Viking (*)	720,000	1.5	1.0	10,800
Sub-Total	920,000	1.6		14,400
Total Mineral Resource				
North Avebury	1,460,000	(**)1.5	0.8	22,500
Viking (*)	2,600,000	1.5	1.0	39,000
TOTAL	4,060,000	1.5		61,500

Notes: (*) 'Viking' was named 'South Avebury' in earlier estimates
(**) Grade is rounded down

Geostatistical analysis of the resource data indicates that higher grade zones are present within both the Viking and North Avebury deposits.

These zones are estimated to contain (refer to Table 4.2):

Table 4.2 – Zones

Deposit	Resource Tonnes	Grade (% Ni)	Cut Off (% Ni)	Cont Metal(t)
North Avebury	630,000	2.0	1.3	12,600
Viking	630,000	2.0	1.6	12,600
TOTAL	1,260,000	2.0		25,200

These resources have been estimated by independent consultant Michael V McKeown of McKeown Mining Pty Limited and reported in accordance with the *Australasian Code for Reporting of Mineral Resources and Ore Reserves* (JORC Code). Michael McKeown is a Fellow of the Australasian Institute of Mining & Metallurgy and has more than five years relevant experience in the estimation, assessment and valuation of mineral resources of this style of mineralisation and type of deposit.

The resource estimate is detailed in a report titled:

'Allegiance Mining NL. Avebury Nickel Project. Mineral Resource Report November 2002' by Michael V McKeown, (Reference 4)

The above resources lie within a global resource estimated as 3.47 Mt 1.0% Ni and 5.39 Mt 1.1% Ni for North Avebury and Viking respectively. The global resource is

essentially defined by a sharp/'hard' hangingwall boundary of 0% Ni and a 'softer' footwall boundary of 0.7% Ni.

Subsequent interrogation of the resource block model has resulted in the identification of zones of mineralisation upon which the mine plan detailed in this study is based. However, until additional in-fill drilling has been completed, it is not possible to classify these resources as a reserve (as defined in the JORC Code).

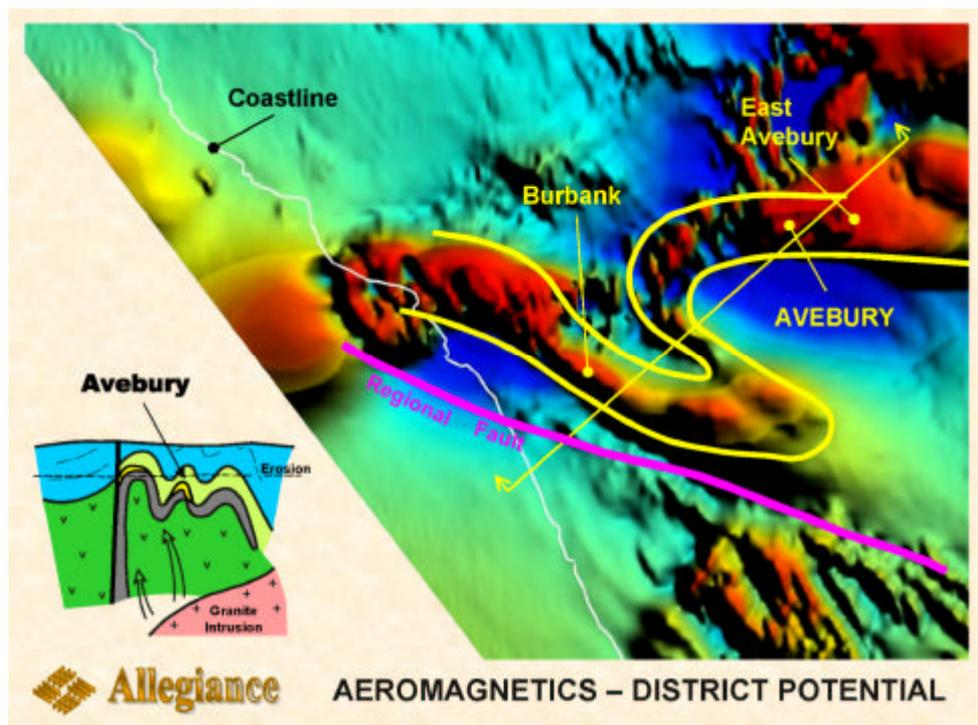
4.3 Resource Potential

In addition to the identified Avebury resource tabulated above, scope exists for the discovery of additional nickel sulfide resources.

Exploration programs completed in the Avebury district by Allegiance have demonstrated the what they consider to be a highly prospective nature of the area for the discovery of additional nickel sulfide resources.

Aeromagnetic survey data is interpreted as indicating the Avebury host rock formation extends both east and west of Avebury (Figure 4.4). Ground work has to date identified three principal areas of on-going interest within these extension zones:

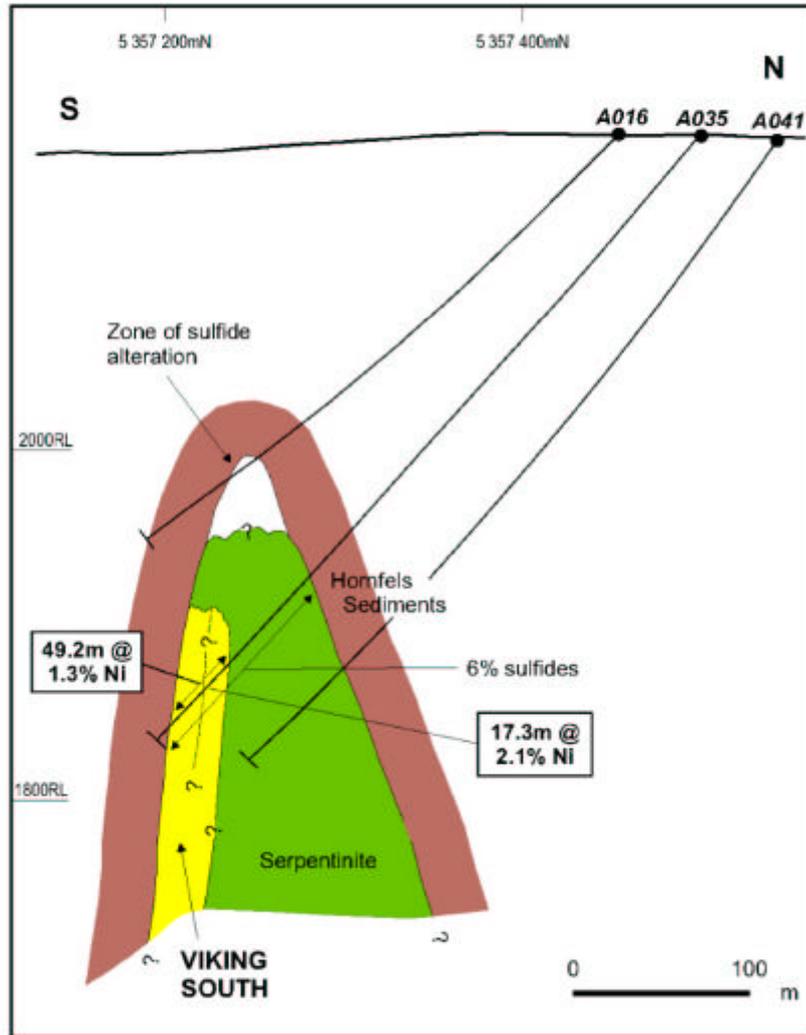
Figure 4.4 – Aeromagnetics Survey



- Western strike extension of the Viking deposit. The most westerly hole in Viking, A 035, intersected 17 m 2.1% Ni within a 49 m zone of 1.3% Ni. If this mineralisation extends along strike to the west it will significantly increase the Viking resources (Figure 4.5) below.
- East Avebury area, approximately 800 m along strike to the east of Avebury where geological, geochemical and geophysical surveys suggest the area is closely analogous to Avebury. Six drill holes have been completed to date, 4 of which intersected significant nickel sulfides.

- Burbank prospect, 4 km west of Avebury, where surface sampling and shallow drilling has identified a 200 m x 70 m zone of weathered ultramafic rocks, typically assaying 1-1.5% Ni, present in clays and iron oxides, interpreted as possibly developed from oxidising sulfides at depth.

Figure 4.5 – Western Strike Extension



Avebury Project - Section 354 300mE - Viking Deposit

Exploration results from these prospective areas are detailed in the following reports:

- *'Zeehan Project EL 28/1988 Annual Report for Period Ending October 2001'* dated 01 November 2001, prepared for Allegiance Mining NL by Newnham Exploration & Mining Services
- *'EL 28/1988 - Trial Harbour - Burbank Prospect. Initial Drilling Program Results'*, dated 10 March 2002, prepared for Allegiance Mining NL by Newnham Exploration & Mining Services
- *Allegiance Mining NL Annual Report 2002*

5.0 DEVELOPMENT STRATEGY

Since Allegiance commenced drilling the Avebury deposit in 1997, the project has been advanced systematically, reflecting an overall development strategy aimed at eventually developing an underground mine on the deposit and marketing high-grade nickel sulfide concentrates.

Following initial drilling, Allegiance completed a **Scoping Study** on Avebury in January 2001. This study was a collation of inputs from various relevant consultants and was designed to conceptualise the potential commercial viability of Avebury and to provide guidance to the direction of further evaluation and development.

The outcomes of the nine-volume study were summarised in the report:

'Avebury Nickel Project Scoping Study: Summary Report 28 January 2001' prepared and collated for Allegiance Mining NL by Newnham Exploration & Mining Services

The Study was based on a resource of 3 Mt 1.7% Ni, two-thirds of which was classified as inferred. It envisaged a 300,000 tpa throughput, an on-site mill and a nickel price of US\$7,000/t.

The report indicated the operation as envisaged was capable of generating a substantial cash surplus. Principal recommendations were:

- the project be advanced to the final feasibility study stage
- to facilitate this, a range of more detailed technical studies would be required
- the district was highly prospective for the discovery and definition of additional resources

Subsequent financial modeling by Allegiance demonstrated that the project economics were substantially enhanced if the annual throughput could be increased beyond the 300,000 tpa level assumed in the Scoping Study.

Reflecting this need for additional resources, identified at a higher level of confidence, and accompanied by further technical studies, Allegiance undertook an additional major core drilling program through 2002. This program resulted in an increase in the

identified mineral resources and the elevation of most of the resources to the indicated category.

Encouraged by these results, the Company decided to advance the Avebury project by way of a three stage development strategy:

- Stage 1:** Construction of a decline tunnel to access the Viking deposit. The decline would both facilitate detailed technical and financial evaluations of Viking and North Avebury, and provide a platform for early production from Viking should the project advance to Stage 2.
- Stage 2:** Off-site processing of 400,000 tpa ore. It was envisaged that this would be undertaken in the Hellyer Mill, under agreement with Western Metals. During Stage 2, the viability of advancing the project to Stage 3 would be assessed and, if appropriate, advanced through the permitting process.
- Stage 3:** Construction of an on-site mill to treat 500,000 tpa of both Avebury ores and ores from other deposits in the district; eg, East Avebury and Burbank.

The principal objectives of Stage 1 were:

- provide access into the upper higher grade sections of Viking for detailed evaluation and Stage 2 production
- facilitate detailed pattern drilling of upper Viking and North Avebury for reserve estimation purposes
- permit evaluation of ground conditions on which to base detailed Stage 2 mine planning, scheduling and costing
- acquire additional samples of mineralisation for metallurgical test work and Stage 2 flow sheet design purposes

Stage 1 development is estimated to cost \$7.5M and take 15 months to complete. This schedule includes a 4-6 month permitting period.

A detailed Stage 1 business plan is presented in a report titled:

“Avebury Nickel Project Stage 1: Viking Decline Development Business Plan” dated May 2003, prepared for Allegiance Mining by BFP Consultants Pty Ltd

Since the preparation of the Stage 1 business plan, the Stage 2 and 3 project strategies have become complicated by corporate developments at the adjacent Hellyer and Renison mill sites.

Initially, Allegiance planned to advance Avebury to Stage 2 by custom treating ore at the idle Hellyer Mill (approximately 90 km from Avebury) because that was the only available mill. However, since June 2003 the opportunity for treating the ore in the Renison Mill (approximately 30 km from Avebury) emerged when the Renison operation was placed in voluntary administration.

Allegiance commenced negotiations with both Hellyer & Renison to attempt to identify a preferred option. The suitability of both milling operations was technically and physically

assessed. The Renison operation appeared to be the more favourable operation, based largely on transportation factors and commercial terms offered.

The milling options were further complicated in early August 2003 when Western Metals was placed in receivership, and the receiver announcing that the Hellyer operation was to be sold, along with the other Western Metals assets.

In the light of these events, Allegiance decided to evaluate the Avebury deposit at the indicative feasibility study level under two development scenarios:

- (a) treatment of Avebury ore through the Renison Mill
- (b) construction of an on-site mill at Avebury

Negotiations are currently in progress between Allegiance, Renison Bell Limited and Murchison United NL, for the treatment of Avebury ore and the sale of nickel concentrates produced.

6.0 STAGE 1 DEVELOPMENT

6.1 Existing Infrastructure

The Avebury deposits lie 2 km south of the Trial Harbour Road, 7 km west of Zeehan. Current access from the deposits to the Trial Harbour Road is by an all weather 4WD track. A new shorter track, which eventually will be the main access route, has been roughed out but currently is not trafficable, even to 4WD vehicles.

The Trial Harbour Road to Zeehan is a tortuous, poor quality, all weather dirt road, owned by the West Coast Council. Zeehan is connected to Renison (17 km) and thence to Burnie (133 km) by the sealed Murchison Highway.

A private railway operated by Tasrail runs from Melba Flats, on the Murchison Highway 10 km north of Zeehan, to Burnie. At Melba Flats there is a concentrates shed and loading facilities, whilst at Burnie trains can discharge into a concentrates storage shed on the Burnie wharves from where the concentrates can be transferred to ships by a bulk ship loader, also owned and operated by Tasrail.

The railway passes within 500 m of the Renison Mill, but there are no train loading facilities at Renison.

State grid power is distributed to Zeehan via a 44kV line from Rosebery. From Zeehan a 22kV line runs to Granville and a spur line runs from this line to the Comstock Mine, 5 km from Avebury.

Potable water is available in several creeks draining the Avebury area, including Kynance, Contiguous and Hemp Creeks, all of which are crossed by existing access roads. Flows in these creeks are highly seasonal. Abundant but non-potable water is available in Comstock Creek to the immediate east of Avebury.

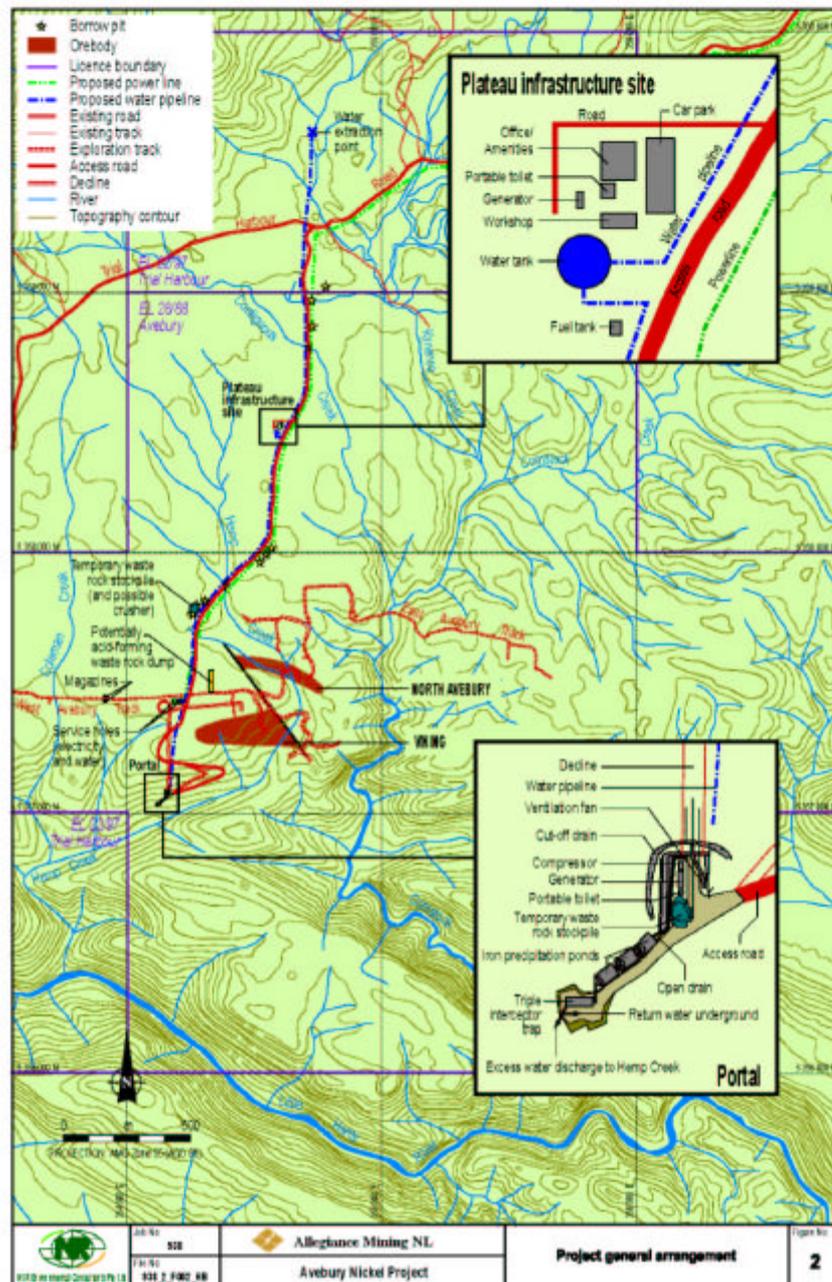
The nearest substantial town is Zeehan (population 1,000). Most commonly required support services are available in the town - fuel, accommodation, welding and plumbing services, shops, Post Office, medical, fire, police services, etc. These services are complemented by those available in the larger nearby towns of Rosebery and Queenstown.

With the recent cessation of operations at the Renison Mine, the population, housing and support services in Zeehan are under substantial downward pressure.

6.2 Stage 1 (Viking Decline) Infrastructure Requirements

The layout of Stage 1 infrastructure requirements is shown on Figure 6.1 (NSR) and detailed in Stage 1 Business Plan i.e. BFP's May 2003 Avebury Nickel Project Report.

Figure 6.1 – Infrastructure Requirements



Stage 1 requires:

- Upgrading the access road from the Trial Harbour Road to the Viking Decline portal site, and construction of the portal box-cut
- Development of support facilities
- Provision of power to the project area

6.2.1 **Access road**

It is proposed that the existing 3 km access track from the Trial Harbour Road to the decline portal and the portal box-cut will be developed in three steps.

Step 1 involves upgrading the track to a reasonable quality all-weather 4WD road, suitable for upgrading to a long-term haulage road.

Step 2 involves re-profiling the road into the Hemp Creek valley to the portal site at uniform 1:10 grade, developing the portal box-cut and distributing that material along the access road so as to uniformly upgrade it to a good quality all-weather road.

Step 3 involves upgrading the road with both crushed and uncrushed rock from the Viking Decline to a high quality haul road standard.

Budget estimate (see Business Plan for details) \$500,000

6.2.2 **Support facilities**

Facilities to support construction of the Viking Decline will be developed on an open plateau area 1.5 km north of the decline portal and at the portal site itself. Topographical and environmental constraints preclude all these facilities being concentrated at the portal.

The plateau facilities will include a small office-ablutions unit, workshop, fuel storage, car park and water supply. If, when the project commences, grid power is not available a diesel generator may be installed temporarily.

The office-ablutions unit would consist of several transportable units, with extended roofing areas for weather protection. They would provide office space, crib room, lamp-first aid room, showers, change rooms.

Workshop would provide an 8 m x 8 m area for routine maintenance of underground equipment, fully equipped with water and power.

Water supply involves the installation of 23,000 litre above ground tanks fed by a water line from Kynance or Contiguous Creeks, and supplying both the plateau and portal facilities. If Contiguous Creek is considered an adequate supply, the cost will be significantly less. Water supply also includes the provision of a trailer mounted fire fighting unit.

Fuel storage provides for diesel storage for underground vehicles. It also provides for waste oil management and bunding. It is assumed tanks will be supplied by the fuel supplier.

Site and waste management provides for a wash bay with concrete floor, a waste water tank and associated plumbing and drainage and general site works and associated drainage management.

Table 6.1 - Plateau facilities cost estimate

Office-ablutions	70,000
Workshop	35,000
Water supply	50,000
Fuel storage	20,000
Site water & waste management	25,000
Plateau Sub-total	\$200,000

The **portal facilities** include waste water management facilities, temporary sub-station and temporary electric compressor. It is assumed the mining contractor will install the ventilation fan to their own, ie statutory, requirements.

If, when the decline construction commences, grid power is not available a diesel compressor and diesel generator will also be installed at the portal.

The waste water management system will consist of iron precipitation ponds, silt and hydrocarbon triple interceptor traps and associated piping.

When the decline is sufficiently advanced, the electric compressor and sub-station will be relocated underground.

Table 6.2 - Portal facility cost estimates (assuming availability of grid power)

Water management	30,000
Electric compressor (purchase)	35,000
Portal Sub-total	\$65,000

6.2.3 Power supply

Two options for Stage 1 power supply were considered. The first option was to initially generate power on site with generators at both the plateau and portal sites, complemented with a diesel compressor at the portal. These temporary installations would be replaced during Stage 1 when grid power was available from Aurora.

The second option was to extend grid power to the project prior to commencement of the decline, thereby eliminating the need for temporary diesel generators and compressor.

The second option is the preferred option for several reasons:

- cost benefits, eliminating hire and installation costs and diesel consumption
- environmental benefits from reduction in diesel storage and movement, noise, etc
- operational benefits with fewer truck movements and change-over disruptions to grid power

The main potential disadvantage of this option is that the decline can not commence until the power is installed at the portal, so careful scheduling will be required.

The grid power supply option involves the following steps:

- (a) Aurora extend the existing 22kV line from the Comstock Mine to the plateau facility area: 5 km @ \$50,000/km = \$250,000.
- (b) Construction of a substation at the plateau facility area to provide 415V power for these facilities and 11kV power for the mine. Estimate based on all new equipment = \$200,000.
- (c) Install an 11kV line to the portal as a combined ABC above ground line, buried in a trench and laid on the surface. Provision of a skid mounted sub-station at the portal to provide 1kV and 415V power to the mine and the portal facilities. Estimate based on all new equipment = \$150,000.
- (d) When the decline is halfway down (500 m) a borehole would be drilled from the surface to the decline and the 11kv line relocated down that hole and connected to the skid mounted transformer that would be relocated from surface to underground. Estimated cost = \$50,000.

An electrical engineering consultant would be required to manage and supervise the above work. Estimated cost = \$50,000.

The total estimate for the above electrical work, based on all new equipment, is \$700,000. However, a combination of negotiations with Government over power supply and the purchase of second-hand major equipment items will probably reduce this to \$650,000-\$700,000.

A budget estimate for power installation is =

\$700,000



In the event that grid power is not available to the project in a timely fashion, development may have to commence using diesel generated power. If the whole of Stage 1 were to be developed using diesel, 500kVA and 250kVA generators would be required at the portal and plateau infrastructure areas respectively, and a diesel compressor would be required at the portal.

Table 6.3 - Comparative cost estimates

	Installation	Running
Grid	700,000	120,000
Diesel	160,000	450,000

For the purposes of this IFS, it has been assumed that grid power will be available.

6.2.4 Supervision and management

Supervision and management of the permitting, installation and construction of Stage 1 infrastructure over a 3-6 month period is estimated at \$186,000.

Estimate total **\$186,000**

6.2.5 Stage 1 Infrastructure Cost Summary

Table 6.4 – Cost Summary

Access road and box cut	500,000
Plateau facilities	200,000
Portal facilities	65,000
Power supply	700,000
Supervision/management	186,000
Estimate Total	\$1,651,000

6.2.6 Decline

Stage 1 involves the development of a 5.5 m x 5 m, decline. The length of the decline has been revised, ie calculated more accurately, since the previous Business Plan (Ref 3). It is expected that the decline will be 1,062 m long decline at 1:7 grade into the top section of the Viking deposit and 182m of stockpiles and potential orebody accesses (total of 1,244m). The cost for this decline has been estimated at \$3.5 million.

The specific costing is discussed later but the decline cost has been estimated to be approx. \$2600/m with a provision of \$250,000 for contractor establishment.

Estimate total **\$3,500,000**

6.2.7 Other studies/ Geological Drilling/ Management/ Finance Estimate

One of the prime objectives of the Stage 1 Viking Decline development is to acquire samples of mineralisation for further metallurgical test work. These samples will be derived from drill cores obtained from in-fill pattern drilling of Viking and North Avebury, and bulk samples taken from exposures in cross-cuts developed off the main decline.

The metallurgical test work is required to facilitate:

- design modifications to the Renison Mill should Avebury ore be processed there
- flow sheet development and detailed design and costing of an Avebury Mill if required
- specification of concentrate composition ahead of off-take agreement negotiations
- environmental management and disposal of tailings
- detailed project financial analysis and evaluation

The cost of acquiring these samples for metallurgical test work is built into the Stage 1 resource definition drilling program and the decline development program.

The cost of undertaking the test work will be subject to negotiation. If the ore is to be processed at Renison, it will be logical for Renison to complete the test work and for the purposes of the Stage 1 Business Plan, it was assumed the costs were split 50:50.

It was further assumed such test work would be undertaken by Renison personnel with inputs by Allegiance's consultant metallurgist.

A budget provision of 150,000 has been allowed for this investigation.

Summary of this and other elements of Stage1 Development are:-

Resource/Reserve Drilling	830,000
Geology & Mining Studies	150,000
Metallurgical Studies	150,000
Environmental Management Plan	150,000
DPEMP	125,000
50% of Final Feasibility Study	150,000
Management Costs	400,000
Financing Costs	200,000
Total	2,155,000

Estimate total

\$2,155,000

The total estimate for stage 1 is expected to be approx. \$7.3m.

Note: No generic contingencies have been allowed in the preceding calculations. Should the project proceed an allowance for contingencies should be made. Such allowances should be approx. 10%. The total draw down for Stage 1 should be \$8.0M although this will be a decision for Allegiance themselves.

TOTAL STAGE 1 COST **\$7,300,000**

7.0 UPGRADES FOR RENISON TREATMENT OPTION

7.1 Infrastructure

In the eventuality of Avebury ore being treated at Renison, the principal infrastructure issues will be:

- Transporting the ore to Renison
- Provision of site services and facilities

7.1.1 Ore transport

The range of options for transporting 400,000 tpa of ore to Renison include:

- (a) trucking ROM ore
- (b) trucking primary crushed ore
- (c) combination rail/road
- (d) slurry pipeline
- (e) conveyor

In options (a) and (b) above, several alternative routes will have to be evaluated:

- combination Trial Harbour Road-Murchison Highway
- purpose built (dedicated) haul road
- combination Trial Harbour Road-Comstock Tramway Road-Murchison Highway

If trucked to Renison, the proposed production rate represents on average 1 x 30 t truck every 20 minutes, and factors other than costs may strongly influence the selection of the transport decision; eg, social issues in Zeehan, heritage issues on roads and old tramways, environmental factors.

Capital and operating costs of the various options will reflect inputs from Government and other potential users.

A thorough analysis of these options will be required for the Stage 2 DPMP and Final Feasibility Study. For the purposes of this indicative study, the

simplest and most readily quantifiable option has been selected; viz, Avebury ore will be primary crushed on site and road freighted 30 km to Renison along the Trial Harbour Road and the Murchison Highway.

The timing of any road upgrade will depend upon the commencement date of the upgrade. For example, a road upgrade beginning in June will be made more difficult because of wet weather and therefore take longer than one beginning in January.

The specific details of the road upgrade have not been examined in this report, however because this may involve community and government input, it may be that this has the possibility to become a critical path for project development. If so, this could mean that the difference between production commencement of the two options, discussed later, may be less than anticipated.

(Note: In the "Treat on Site" option, due to the far smaller volume of traffic, this allowance has been capped at \$0.5M. A detailed cost will depend on a variety of factors and it is thought that the examination of such are outside the scope of this report but will be required for further detailed studies.)

Budget provision **\$1,500,000**

7.1.2 Site services and facilities

With Avebury moving to underground production at 400,000 tpa, Stage 1 facilities will have to be upgraded accordingly. This will include stores, workshops, offices, change room facilities, etc.

Budget Provision **\$500,000**

7.2 On-site Treatment-Infrastructure Requirements

In the eventuality of Avebury ore being treated on site, the principal infrastructure issues will be:

1. access road upgrade
2. power supply upgrade
3. provision of site facilities

7.2.1 Access road

The Trial Harbour Road will require upgrading for:

- mill construction
- daily operating traffic
- concentrates transport

During the mill construction stage, there will be a substantial increase in heavy traffic on the road, probably for a 6-month period.

Daily operating traffic, including workforce, suppliers, contractors, visitors, etc, will be substantial for a 400,000 tpa operation.

Approximately 25,000 t of concentrates will be trucked from the operation. Whilst the above traffic predictions are not as substantial as those for trucking ore to Renison, they are still beyond the capacity of the current road system between Zeehan and Avebury.

Budget provision **\$500,000**

7.2.2 *Power supply*

The 22kV line established for Stage 1 development will be adequate for an operation trucking ore to Renison but not for operating a 400,000 tpa on-site mill, with an anticipated 5-7MW demand.

Government has indicated that should an on-site mill be constructed, it will either replace the existing 22kV line with a 44kV line or run a branch 44kV line from its proposed line connecting the Heemskirk wind farm with the Zeehan substation.

Allegiance will be required to upgrade the Avebury substation and distribution network.

Budget provision **\$500,000**

7.2.3 *Site facilities*

On-site treatment of ore will mean a substantially larger workforce with a corresponding demand on site infrastructure facilities, such as offices, workshops, change rooms, water and waste management.

Budget provision **\$500,000**

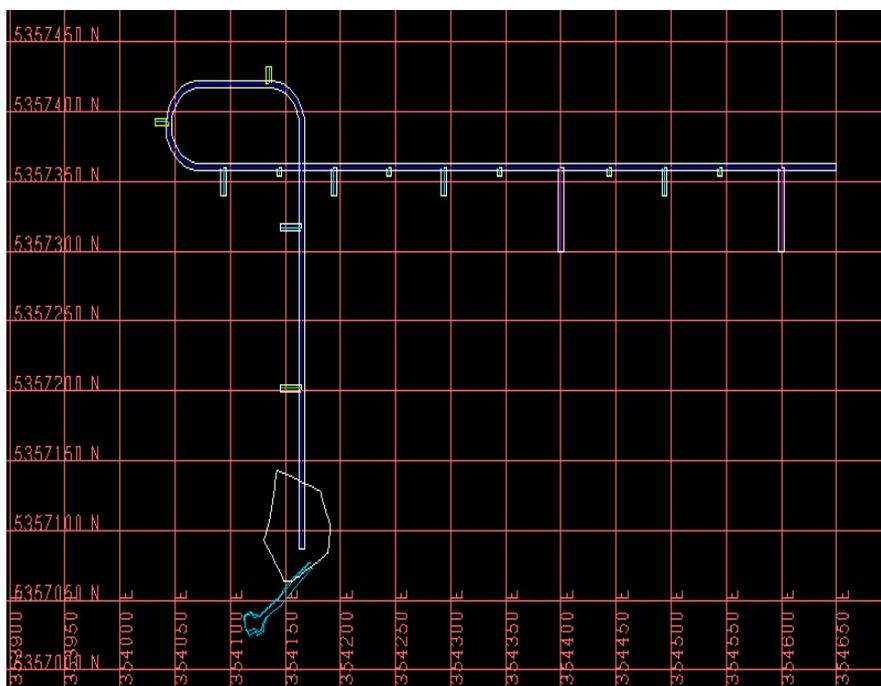
8.0 MINING DEVELOPMENT

8.1 Stage 1 Development

The Viking and Nth. Avebury orebodies will be accessed from one portal as previously described. Stage 1, Exploration Decline, involves development of a 5.5 m x 5 m, 1,062 m long decline at 1:7 grade into the top section of the Viking deposit and 182m of stockpiles and decline accesses (total of approx.1244m). The decline will facilitate completion of detailed technical and financial analyses of Viking ahead of a decision to progress to production.

A plan view of the Stage 1 decline can be seen in Figure 8.1 and a view looking Sth East of the decline and the Viking orebody in Figure 8.2. Figure 8.3 shows the same Sth. East view with the Viking and the Nth. Avebury orebody.

**Figure 8.1 – Plan View
Exploration Decline
Stage 1**



**Figure 8.2 – View of Stage 1, Exploration
Decline, Looking Sth. East**

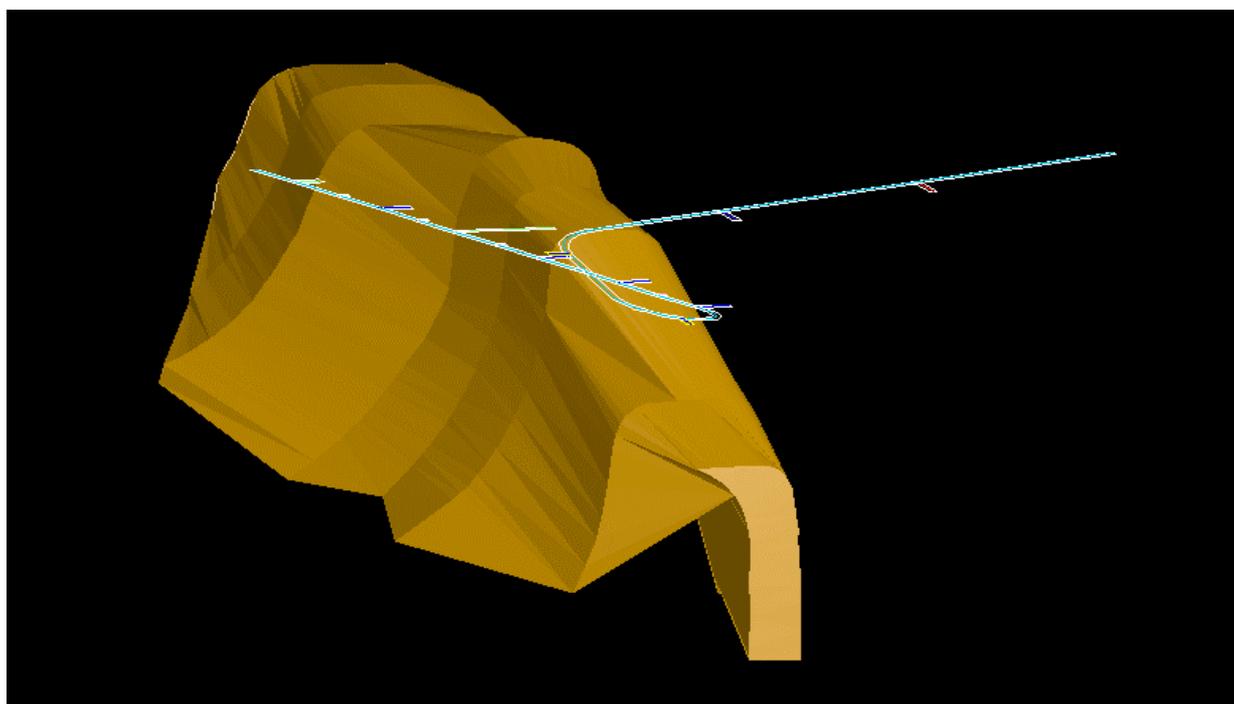
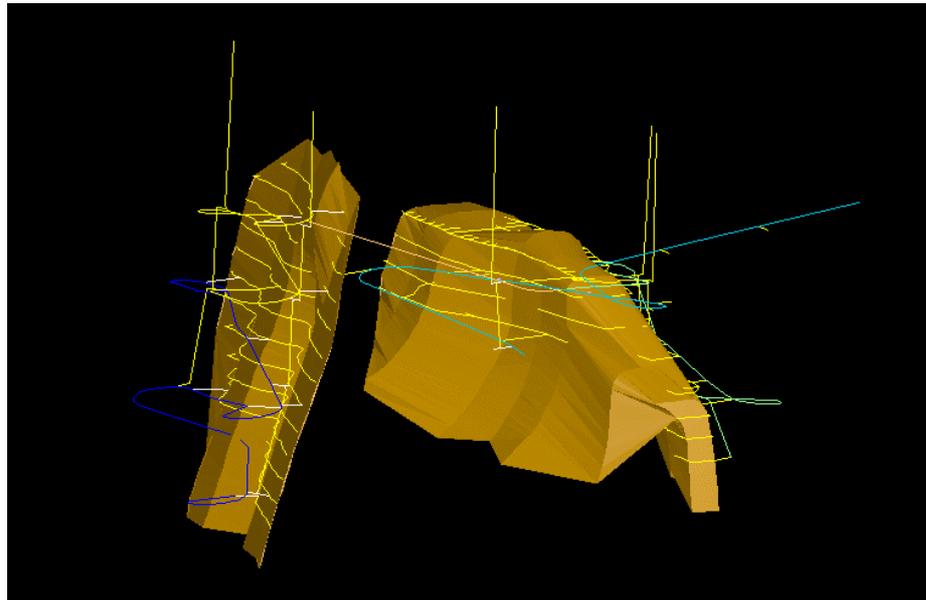


Figure 8.3 - Decline Development



Due to Viking's "saddle" shape and the probability that there is poor ground between the saddle's flanks, two declines will be required once the top of the orebody is reached. The second decline will commence at approx. 100m below the portal but will not be required until ore is accessed from the first decline. i.e. The second decline and the capital expenditure should lag well behind the first.

A third decline will be required to access the Nth. Avebury ore.

The provision of two declines for Viking also enables Avoca style system of filling for Viking stopes and can provide multiple production faces.

The main declines will be approx. 5.5m High x 5m Wide driven at a grade of -1:7, except for corners where -1:10 will be used. Turning bays of approx. 15m length have been allowed for every 100m of decline. These in turn will be available as diamond drilling stubs or orebody access points. The upper, flatter part of the orebody will be driven transversely whilst the flanks will be driven longitudinally.

Provision has been made for three vent shafts and two escape ways. The escape ways are provided on the basis that one is required for each decline. There may be an opportunity to reduce this to one escape way but this will depend upon the possibility of constructing connecting drives. This option has not been examined for this report.

Table 8.1 – Development Total Mine Development Summary

Viking Description	metres
Stage 1, Decline and crosscuts	1244
Viking Decline (Beyond Stage 1)	1956
Vent / Escape ways	1000
4m X4m, ore development	9,185
Crosscuts to orebody / connection to vent etc.	1,000

Nth. Avebury Description	metres
Decline	3300
Vent / Escape ways	800
4m X4m, ore development	4,300
Crosscuts to orebody / connection to vent etc.	800

Total Development	metres
Declines	6,500
Vent / Escape ways	1,800
4m X4m, ore development	13,485
Crosscuts to orebody / connection to vent etc.	1,800

The cost of any "in - ore" development is incorporated into the overall stoping costs.

8.2 Development Schedule

8.2.1 Stage 1

Stage 1 development occurs over a nine month period at approx. 150m/mth. It is scheduled as shown in Table 8.2.

Table 8.2 – Stage 1 Development Schedule

Heading	SumOfSlope	Dev Tonnes	1/02/2004	1/03/2004	1/04/2004	1/05/2004	1/06/2004	1/07/2004	1/08/2004	1/09/2004	1/10/2004	TOTAL
Upper_Avb_Incline	42							3	30		9	42
Baldock_Decline	1062		120	138	132	126	132	132	132	132	18	1062
Hart_Decline	693							18				18
BD_SP_1	18			18								18
BD_SP_2	18			12	6							18
BD_SP_3	18						18					18
BD_SP_4	18						6	12				18
BD_SP_5	10				10							10
BD_SP_6	10					10						10
BD_SP_7	18										18	18
DD_cud_1	4						4					4
DD_cud_2	4							4				4
DD_cud_3	4										4	4
DD_cud_4	4										4	4

8.2.2 **Total Mine**

The subsequent mine development is shown in Figure 8.3. Detail scheduling has been undertaken for years 1-3 whilst the rest the mine's development, as shown in Table 8.3, is extended over the life of the mine. The development summary for years 1-3 is shown in this table.

Initial development is undertaken so that the higher grade areas of the upper part of the Viking orebody can be accessed and stoped as soon as possible. The schedule reflects this requirement.

8.3 Geotechnical

There is little specific geotechnical information available except for the first leg of the decline. A geotechnical hole has been drilled for approx. 300m along the length of this leg.

The hole indicated poor ground conditions at its collar and it for this reason, amongst others, that a portal cut will be constructed here effectively mining this poor material by "open cut" methods. The portal cut also provides a base for a lay-down area and room for a minor amount of transitional ore storage.

Beyond the collar, the ground condition in this hole are reasonable to good, so it is expected that minimal ground support will be required. For the purposes of this study the following ground support regime in waste development has been adopted:-

- Backs - 4 bolts per 1.5m
- Walls - 2 bolts/wall/1.5m
- Mesh - Mesh all backs and two metres of each wall .ie 9m²/m advance.
(The full extent of this meshing may not be required however a conservative provision has been made for the purposes of this study.)

Note: For longevity and stiffness, all bolts are to be fully grouted, galvanised, nominally 45mm dia., friction anchors.

8.4 Costs

Five contractor organisations were approached to provide "budget estimates" for development at Avebury. The contractors consisted of three large and two minor contracting organisations. The prices sought included mobilisation, demobilisation ore haulage (approx. 700m from the portal), development and ground support.

Given a decline distance of approx. 1000m the prices varied from \$2,475/m to \$4,044/m.

As matter of interest, if the total decline distance of 4000m were to be used as the basis for cost comparison, the prices would vary from \$1,500/m to \$3,000/m. (It appears that the \$1,500/m rate may be an anomaly in this situation. i.e. This rate is a function of the way the comparison spreadsheet operates).

The actual cost per metre for development will ultimately depend upon the quantum of development and the chosen contractor i.e. a large national firm or a local Tasmanian (West Coast) contractor.

It was notable that specific examples of both were close to each other in overall unit cost i.e. approx. \$2,400/m.

For purposes of this study the cost adopted for major development, therefore is: \$2,600/m.

A lower estimate for smaller, 4m x 4m, ore development has been used i.e. \$2,000/m. A raise boring estimate, for a raise of a diameter of approx. 3.0m, of \$2,500/m has been used.

Long-hole raises are estimated to cost \$1,500/m.

The total costs for waste development amount to \$4.87 per tonne including the allocated fixed costs.

8.5 Development Capital Costs

8.5.1 Stage 1 – Exploration Decline

As previously described Stage 1 involves the development of a 5.5 m x 5 m, 1,062 m long decline at 1:7 grade into the top section of the Viking deposit and 245m of stockpiles and decline accesses (total of 1244m). The cost for this decline has been estimated at approx. \$3.5 million.

8.5.2 Pre-Production Development

In order for full production, it is necessary to complete access into the orebody, provide an emergence escape way and main ventilation exhaust way.

This development consists of:

- Two main raise bored rises, one ventilation rise and one escape way (approx. 425 metres)
- One internal ventilation rise between the drill and extraction level (25 metres)
- Level development to access the ore horizon and the rises (390 metres)
- Off decline connection to the exhaust ventilation rise (30 metres)

The total cost of this development is estimated at \$3.1 million consisting of:

	\$M
• Mine Admin & Geology (including delineation drilling)	0.7
• Fixed Costs consisting of mine services and power	0.4
• Development cost	2.0
Total	3.1

9.0 MINE PRODUCTION

9.1 Description

For the purpose of general description the mine has been broken up into the following categories:-

- Viking Upper saddle
- Viking Southern flank
- Viking Northern flank
- Nth. Avebury

Proposed mining methods have been adopted on the basis of relatively little geotechnical data. This will be discussed later.

A variety of stoping methods have been considered with following criteria being the basis for consideration:-

- Operator safety
- Cost of extraction
- Production rate
- Extraction ratio

Whilst this report does not provide detail on every mining option available the method chosen was done cognisant of each of the above.

In general terms the following mining methods have accompanying problems:-

Mining Method	Positives	Negatives
Open Cut	Low cost. No operator exposure.	Environmental damage
Sub level cave	Low cost. No operator exposure.	Impact on surface topo & environment
Open Stoping	Low to mod cost. No operator exposure	Minor impact on surface topo & environment if any.
Bench Stoping	Low to Mod cost No operator exposure.	No impact on surface topo & environment .
Cut and Fill	Selective mining	Rel. High cost. Exposure of personnel to ground conditions. High requirement for fill material

9.2 Production Schedule

The mining inventory and method of conversion is summarised in Table 9.1.

VIKING ORE ZONE			Nth AVEBURY ORE ZONE			
Estimated Ore Resource	ktonnes	2,500	Estimated Ore Resource	ktonnes	1,550	
Block Model Grade	grade %ni	1.5	Estimated Grade	grade %ni	1.42	
Avg. Recovery	%	85%	Avg. Recovery	%	85%	
Recovered Tonnage	ktonnes	2,125	Recovered Tonnage	ktonnes	1,318	
plus Dilution	%	10%	plus Dilution	%	10%	
	ktonnes	213		ktonnes	132	
Est. Dilution grade	grade %ni	0.75	Est. Dilution grade	grade %ni	0.75	TOTAL MINE
						RESERVE (kt)
Ore Reserve	ktonnes	2,338	Ore Reserve	ktonnes	1,449	3,787
Grade	grade %ni	1.43	Grade	grade %ni	1.36	1.40

The size of the Nth. Avebury ore resource is slightly larger in tonnes but lower in grade, than discussed in section 4.2 (1.55Mt @1.42% compared 1.46@1.5%) due to the mechanism by which the geological block model was accessed. The difference in nickel metal is negligible.

Production

The method of conversion can be seen in Table 9.2.

In summary :-

Development	Dilution	0%
Production	Dilution	10%
	Diluant Grade	0.7%
Overall mining resource recovery		85% (Presumed)

Table 9.2 – Mining Inventory Calculation

VIKING ORE - RESOURCE SUMMARY										Assumes 100% rec. dev tonnes (20% of insitu ton)		
Z Interval	Volume	Tonnes	%Ni	Dilutant Grade:		Diluted Tonnes	Diluted Grade %Ni	Dev Tonnes	Grade %Ni	Prod Tonnes		
				Recovery	Dilution							
				85%	10%			20%				
2000.0-2025.0	79,000	237,000	1.663	201,450	20,145	221,595	1.58	47,400	1.66	189,600		
1975.0-2000.0	344,500	1,033,500	1.486	878,475	87,848	966,323	1.41	206,700	1.49	826,800		
1950.0-1975.0	205,375	616,125	1.47	523,706	52,371	576,077	1.40	123,225	1.47	492,900		
1925.0-1950.0	114,125	342,375	1.494	291,019	29,102	320,121	1.42	68,475	1.49	273,900		
1900.0-1925.0	62,500	187,500	1.437	159,375	15,938	175,313	1.37	37,500	1.44	150,000		
1875.0-1900.0	40,500	121,500	1.434	103,275	10,328	113,603	1.37	24,300	1.43	97,200		
1850.0-1875.0	32,125	96,375	1.594	81,919	8,192	90,111	1.51	19,275	1.59	77,100		
1825.0-1850.0	9,125	27,375	1.599	23,269	2,327	25,596	1.52	5,475	1.60	21,900		
Grand Total	887,250	2,661,750	1.498	2,262,488	226,249	2,488,736	1.43	532,350	1.50	2,129,400		
AVEBURY NORTH - RESOURCE SUMMARY										Assumes 100% rec. dev tonnes (20% of insitu ton)		
Z Interval	Volume	ORE tonnes	Grade % Ni	Dilutant Grade:		Diluted Tonnes	Diluted Grade %Ni	Dev Tonnes	Grade %Ni	Production Tonnes		
				Recovery	Dilution							
				85%	10%			20%				
2020.0-2045.0	34,531	103,594	1.15	155,218	15,522	170,740	1.11	20,719	1.15	82,875		
1995.0-2020.0	57,250	171,750	1.17	257,339	25,734	283,072	1.13	34,350	1.17	137,400		
1970.0-1995.0	83,078	249,234	1.21	373,435	37,344	410,779	1.16	49,847	1.21	199,387		
1945.0-1970.0	97,813	293,438	1.3	439,668	43,967	483,635	1.25	58,688	1.3	234,750		
1920.0-1945.0	81,219	243,656	1.31	365,078	36,508	401,586	1.25	48,731	1.31	194,925		
1895.0-1920.0	53,109	159,328	1.35	238,726	23,873	262,599	1.29	31,866	1.35	127,462		
1870.0-1895.0	33,484	100,453	1.55	150,512	15,051	165,563	1.47	20,091	1.55	80,362		
1845.0-1870.0	19,438	58,313	1.9	87,372	8,737	96,109	1.79	11,663	1.9	46,650		
1820.0-1845.0	18,719	56,156	2.25	84,140	8,414	92,554	2.11	11,231	2.25	44,925		
1795.0-1820.0	11,063	33,188	2.35	49,727	4,973	54,699	2.20	6,638	2.35	26,550		
1770.0-1795.0	15,719	47,156	2.48	70,655	7,066	77,721	2.32	9,431	2.48	37,725		
1745.0-1770.0	10,750	32,250	2.48	48,321	4,832	53,153	2.32	6,450	2.48	25,800		
	516,172	1,548,516	1.42	2,320,192	232,019	2,552,211	1.36	309,703	1.42	1,238,813		
Viking and Avebury Nth Combined TOTAL:								842,053	1.47			

The above represents the use of resources to create a mining plan. Given the level of examination and therefore the level of confidence used in this report, approx.+20%, the resources are not converted into reserves.

A broad mining schedule is shown in Table 9.3 below:-

Table 9.3 – Mining Schedule

VIKING ORE - RESOURCE SUMMARY			2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014		
Z Interval	tonnes	grade	0	1	2	3	4	5	6	7	8	9	10		
2000.0-2025.0	224,676	1.59		100											100
1975.0-2000.0	979,758	1.43		300	400		220	50							970
1950.0-1975.0	584,087	1.41				400	180								580
1925.0-1950.0	324,572	1.44									145	180			325
1900.0-1925.0	177,750	1.38										180			180
1875.0-1900.0	115,182	1.38											40		115
1850.0-1875.0	91,364	1.53												75	90
1825.0-1850.0	25,952	1.53													25
Grand Total	2,523,339	1.44													25
AVEBURY NORTH - RESOURCE SUMMARY															
Z Interval	tonnes	grade													
2020.0-2045.0	98,207	1.12					50								50
1995.0-2020.0	162,819	1.14					160								160
1970.0-1995.0	236,274	1.17					140	100							240
1945.0-1970.0	278,179	1.26						270							270
1920.0-1945.0	230,986	1.27						30	200						230
1895.0-1920.0	151,043	1.30							150						150
1870.0-1895.0	95,229	1.49							50	50					100
1845.0-1870.0	55,281	1.81								50					50
1820.0-1845.0	53,236	2.14									50				50
1795.0-1820.0	31,462	2.23										30			30
1770.0-1795.0	44,704	2.35											45		45
1745.0-1770.0	30,573	2.35												30	30
	1,467,993	1.37													3790
			TOTAL	400	400	400	400	400	400	400	400	400	190	3790	3790
			Grade	1.47	1.43	1.41	1.42	1.18	1.24	1.31	1.81	1.41	1.47		3991.332
	3,991,332	1.42		1.7	1.51	1.42	1.43	1.2	1.2	1.74	1.34	1.44	1.5		

The grades shown in this schedule are for 10 X 400,000 tpa years. Year 1 in the financial model represents a production figure of 316,000 tonnes. As previously mentioned this will be sought from the high grade area of the upper transverse stopes in the Viking orebody that will be mined first to maximise cashflow.

Detailed stope scheduling has not been undertaken however a best estimate has been provided for the project's first three years.

9.3 Construction Schedule

Approximate project construction schedules can be seen in the following tables. Table 9.4 shows a schedule for the Treat at Renison option whilst Table 9.5 shows the schedule for the Treat on Site option.

Table 9.4 – Construction Schedule Mill at Renison

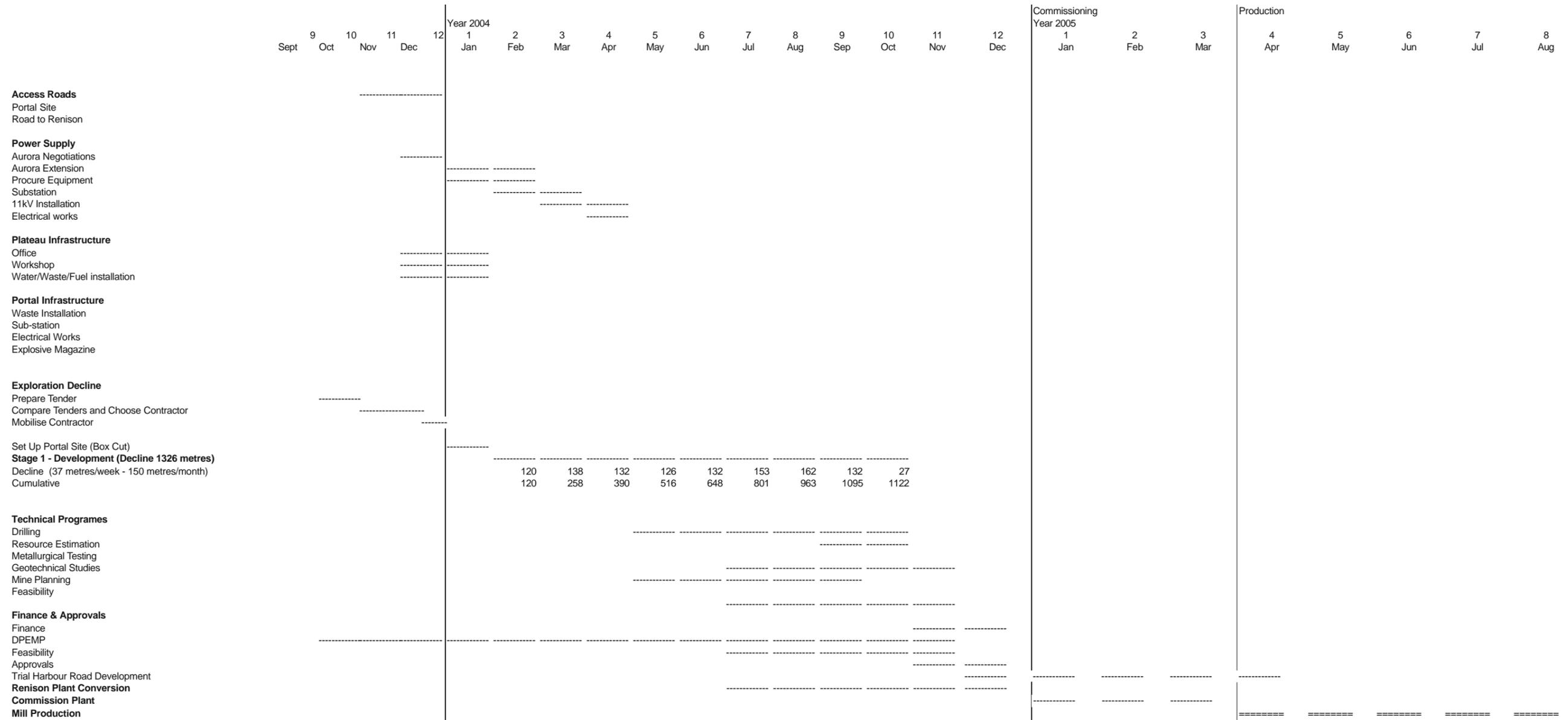
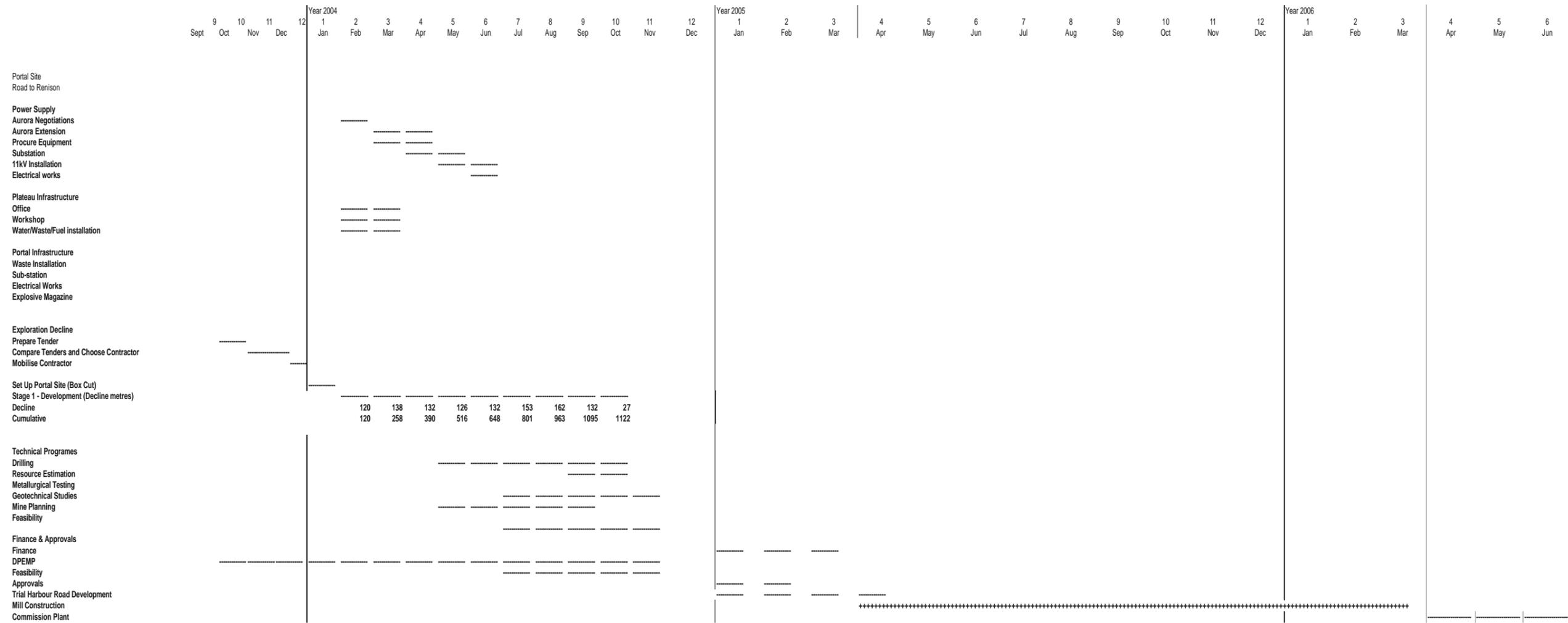


Table 9.5 – Construction Schedule Mill on Site



9.4 Geotechnical

Little useable information i.e. limited geotechnical logging and no specific geotechnical interpretation, of the ore bodies have been done on the Avebury deposit. For this reason it is difficult to determine stope spans and pillar locations. The information that is available, has been used as a basis for determining stope sizes. In December 2000, A.J. Bruce of AJ Bruce Consulting compiled an "Avebury Prospect, Mine Scoping Study" (Reference 5). In Chapter 3, Mr Bruce discusses geotechnical aspects of Avebury deposit and undertook what he described as "**a relatively conservative approach**" to providing estimates of rock mass properties.

Copies of Mr Bruce's assumptions are contained in Appendix 1. The most appropriate mining method determined by Mr Bruce was Open Stopping for North Avebury (Viking). He determined the following stoping dimensions:-

	Footwall	Backs	Hangingwall
Stope Height/Width	20.5m*	7.0m	20.5m*
Stable Stope Length	44m	Infinite	20m

* From Bruce, Chapter 6, Mine Development, Section 6.1, Sublevel intervals, page 21. It appears that this dimension is floor to floor. Bruce states allowed span is 25m.

Without the availability of better information the Nth. Avebury information has been used for Viking. Given Mr. Bruce's comments about his "relatively conservative approach" it could be concluded that the spans used above are similarly conservative.

The proposed mining methods have been planned such that the maximum dimensions, above, are adhered to as closely as possible.

9.4.1 Transverse stopes

Primary

Stopes will be mined at 20 metres lengths, 10 metres wide with 25m back to floor exposure (or put another way, 20m floor to floor exposure). The back width will be wider than the 7.0m suggested by Bruce and therefore these will require additional support undertaken by cable bolting using an estimated 3 x 8.0m length double strand, bulbed, cables at 1.5m spacings. This estimate is coarse and will require refinement in subsequent studies.

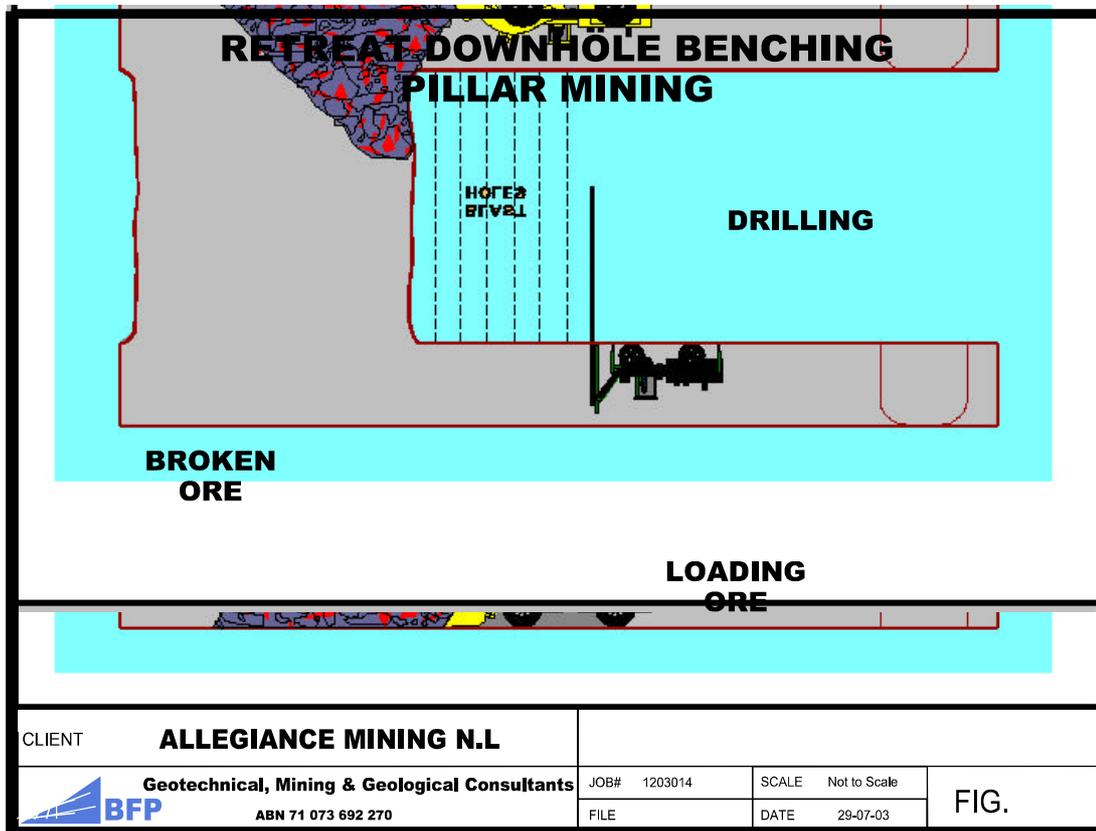
Once a 20 metre length has been mined the stopes will be filled with CAF to enable another 20 metre section to be undertaken.

Secondary

Subsequent secondary stopes will ultimately have an artificial hangingwall and footwall created by the cemented rockfill from the primary stopes. They will be developed at 4m x 4m and stoped at a width of 21m. As per the primary stopes, the back width will be wider than the 7.0m suggested by Bruce as a maximum unsupported span. Therefore the development will require additional support, undertaken by cable bolting using an estimated 3 x 8.0m length double strand, bulbed, cables at 1.5m spacings. These stopes will not be filled after mining.

The dimensions of the pillars, stope widths etc., in these stopes will require refinement in further studies. The above is an estimate to determine the practical cost of mining for this study.

Figure 9.1 - Illustration of Mining Method



9.4.2 Southern, Northern Flank Stopes and Nth Avebury

These longitudinal stopes will be mined using Bruce's suggested span intervals. Where the width of the stopes exceeds 7.0m extra support will be installed. This will be 3 x 5.0m length double strand, bulbed cable bolts at 1.5m spacing. For the purposes of determining a cost estimate it is presumed that 50% of the stopes will be greater than 7.0 m in width and therefore require cable bolting. This estimate is coarse and will require refinement in subsequent studies.

Five metre wide rib pillars will be left every 20m to break up the stope spans. There are opportunities to increase the stope lengths by further geotechnical examination and/or placement of extra cables or pre placed concrete rib pillars. The latter would required the mining of ribs at 20 metre intervals along strike. These ribs will be filled with a bottom cap of high strength concrete and the remainder with CAF. The remaining stopes would be mined from the extremity of each orebody, retreating to each of the artificial rib pillars, which are left in place. In this manner stope span lengths will be maintained at 20m.

The latter has not been costed as part of this study but is an opportunity to be examined in further studies and would maximise ore extraction.

Crown pillars most probably will be required at selected points throughout the mine. Due to the sparse geotechnical information that is currently available it is presumed that the use of such pillars will enable an extraction rate of 85%.

9.5 Mining Methods

9.5.1 Upper saddle

Top and bottom Upper saddle bottom drill drives for primary stopes, 4m wide, will be driven across the orebody, transversely, from Nth to Sth. These will have a vertical separation of 25m lower floor to upper backs i.e. a pillar of 16m.

When completed these stopes will be, tight, filled with cemented aggregate fill (CAF) to enable the extraction of the secondary stopes alongside.

The secondary stopes will be driven from Nth to Sth across the strike of the orebody. The backs will require cable bolting. The development will again be 4m wide whilst the stopes will be approx. 15m wide with the same vertical separation. It is not proposed to fill these stopes mainly due to a lack of available fill.

9.5.2 Southern, Northern flanks and Nth Avebury

Southern and Northern flanks will be mined longitudinally via a full width, 8-10m, retreat benching method.

At Nth. Avebury where the ore body is wider, upper and lower drives will be undertaken. The stope will ultimately be fired at full width via similar retreat benching. In the wider areas the development drives will be cable bolted. Where possible, fill will be introduced into the stopes. Where this is not possible and ground conditions dictate rib pillars will be left along strike to break up span lengths.

9.6 Production

9.6.1 Production Rate

Production rates of 400,000tpa have been examined in this report and given the amount of development especially in the upper part of the Viking saddle this will be achievable.

As a matter of explanation, a production rate of 400,000tpa is the equivalent conservatively 1,333t per mine working day. (Based on a conservative 300 available working days per year)

A typical 4mH x 4mW x 3mL development face produces approx. 150t (This presumes an in-situ density of approx. 3.0t/m³). Therefore to achieve the required production approx. nine ore development faces would be required per day if all the ore were to be gained from development.

In stoping terms each metre of transverse stope produces approx. 500t of ore (16mH x 11mW x 1m x 3.5t/m³). Longitudinal stopes produce less depending on the width. To achieve 1333t per day approx. 2.7m of stopes will be required per day.

Given the number of faces available in the transverse stopes such a production rate should be achievable.

An optimisation of production rates has not been done as part of this study however it is expected that because of the availability of development faces and therefore production stopes in the first few years of the mine's life, a rate of 500,000 tpa is considered reasonable for years 1-5. To achieve this a change in the development schedule would be required. This will entail the recommencement of decline development in the second year of mine life. Before any commitment is made to increase production rates further studies will be required.

9.6.2 Production Methods

Drill and Blast

The drilling of stopes will be done by longhole rigs. An example of this type of rig is the Atlas Copco Simba 254. This rig is able to drill uphole between 51mm and 89mm diameter, over a length of 33 metres. It is therefore capable of both production drilling and cable bolt drilling. Equivalent machines from other manufacturers exist.

Typically a single Simba rig as described above can produce approx. 500,000t per year on a 2 x 12 hours shift basis, 5 days per week, 52 weeks/year with 80% machine availability

Blasting will be undertaken using non-electric detonator systems and ammonium nitrate fuel oil mixture (ANFO) where possible. Depending upon the amount of water in the orebody, water resistant, emulsion type, explosives may be required.

Blasting of stope perimeter holes will be done by lowering the hole diameter to minimum thus reducing the energy in each perimeter hole and providing optimum wall conditions.

Underground - Surface Haulage

Table 9.6 – Rate of Face Bogginq

RATE OF FACE BOGGING								
ELPHINSTONE R2900								
	In Situ	Loose	Bucket Capacity	Load Tonnes				
S.G. Ore	3.30	2.06	8.80	18.15				
S.G. Mullock	2.80	2.00	8.80	17.60				
Design Capacity - Tonnes	10.20							
Design Capacity - Cubic Metres	8.80							
Ore								
Capacity - Tonnes Ore	10.20							
Capacity - Cubic Metres Ore (loose)	4.95							
Mullock								
Capacity - Tonnes Mullock	10.20							
Capacity - Cubic Metres Mullock (loose)	5.10							
Item	Ore Drive	Tele remote stope	back fill stope	access	Decline			
Grade	1:50	1:50	1:50	0:05				
Time to Load, Dump Manouver	0.80	1.60	0.80	0.80	0.80	0.80	0.80	0.80
Constant	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67
Average Speed Km/h	7.50	6.00	6.00	5.00	5.00	5.00	5.00	5.00
One Way Trammng Distance	100.00	100.00	130.00	80.00	130.00	50.00	125.00	100.00
ORE								
Rate of Production (Tonne/min)	4.25	2.83	3.00	3.75	2.60	5.10	2.68	3.19
Rate of Production (m3/min) (loose)	2.06	1.37	1.45	1.82	1.26	2.47	1.30	1.55
MULLOCK								
Rate of Production (Tonne/min)	4.25	2.83	3.00	3.75	2.60	5.10	2.68	3.19
Rate of Production (m3/min) (loose)	2.13	1.42	1.50	1.88	1.30	2.55	1.34	1.59
Avail	80%							
Utilisation	90%							
Time avail/shift	7.30							
Total hr avail/shift	5.26							
Total hrs avail/day	15.77							
tonnes per shift	1,340	894	946	1,183	821	1,609	847	1,005
tonnes per day	4,021	2,681	2,839	3,548	2,462	4,826	2,540	3,016

Bogging will be undertaken by 8-9m³ front end loaders such as the CAT R2900. These loaders can be able to be operated remotely providing operator safety at the brow of stopes.

Bogging will be undertaken by 8-9m³ front end loaders such as the CAT R2900. These loaders can be able to be operated remotely providing operator safety at the brow of stopes.

Table 9.6, above, shows that the R2900 loader can produce approx. 2700 t per day whilst operating on remote control.

Ore and waste haulage will be undertaken by the use of 35-40t, "ejector" tray trucks. The trays of these trucks will allow the dumping of development waste in stopes.

Table 9.7, below, indicates that approx. two trucks could accommodate both waste and ore production in the early years of the mine.

Table 9.7 – Rate of Face Trucking

RATE OF FACE TRUCKING					
ELPHINSTONE AD 45					
	In Situ	Loose	TRAY Capacity	Load Tonnes	
S.G. Ore	3.30	2.06	18.00	37.13	
S.G. Mullock	2.80	2.00	18.00	36.00	
Design Capacity - Tonnes	40.00				
Design Capacity - Cubic Metres	18.00	(PRESUMED)			
Ore					
Capacity - Tonnes Ore	37.13				
Capacity - Cubic Metres Ore (loose)	18.00				
Mullock					
Capacity - Tonnes Mullock	36.00				
Capacity - Cubic Metres Mullock (loose)	18.00				
Item	FLAT	UPHILL	DUMP	DOWNHILL	
Grade	1:50	1:7		-1:7	
Time to Load, Dump Manouever	2.00		2.00		
Constant	16.67	16.67	16.67	16.67	
Average Speed Km/h	7.50	10.00	7.50	15.00	
One Way Trammig Distance	100.00	2,100.00	20.00	2,100.00	
ORE					Total
Rate of Production (min/load)	3.60	25.19	2.32	16.80	47.91
Avail	90%				
Utilisation	90%				
Time avail/shift	7.30				
Total hr avail/shift	5.91				
Total hrs avail/day	17.74				
load per shift					7
ore tonnes per day					825
Item	FLAT	UPHILL	DUMP	DOWNHILL	
Grade	1:50	1:7		-1:7	
Time to Load, Dump Manouever	2.00		2.00		
Constant	16.67	16.67	16.67	16.67	
Average Speed Km/h	7.50	10.00	7.50	12.00	
One Way Trammig Distance	100.00	750.00	100.00	750.00	
MULLOCK					
Rate of Production (Tonne/min)	3.60	9.00	3.60	7.50	
ORE					Total
Rate of Production (min/load)	3.60	9.00	3.60	7.50	23.70
Avail	90%				
Utilisation	90%				
Time avail/shift	7.30				
Total hr avail/shift	5.91				
Total hrs avail/day	17.74				
load per shift					15
waste tonnes per day					1,617

9.7 Filling

Various options exist for void filling and these depend upon the site adopted for milling. It is anticipated that the primary, transverse stopes and the "longitudinal" stopes will be the only ones filled with waste rock, cemented or un-cemented.

If treatment occurs on site a cycloned tail will be available for stope filling. Fill material may be obtained from the waste dumps at the nearby Comstock Mine.

Specific costs have not been allowed in the evaluation spreadsheets, other than that allowed for cemented fill of the primary transverse stopes. It is expected that the extra cost for filling to be relatively small and it is best allocated during later studies when the availability of a cycloned tail, for example, is clearer.

Total stope void to be filled:-

$$3,900,000\text{t} / 3.3\text{t/m}^3 = 1,200,000\text{m}^3$$

Fill from development

6500m + 1800m = 8300m, Development height X width = 5.5m X 5.0m, Volume 27.5m³ /m advance, Swell 1.35.

Volume of material available from development- 310,000m³

9.8 Costs

Mining costs have been based on unit costs estimated for the particular stoping method chosen. At this stage due to the relatively limited geotechnical information it has been decided to base the mining method on 10 metre wide primary stopes and 21 metre wide secondary stopes. The primary stopes will be filled with cemented rock fill thus allowing high recoveries from the secondary stopes.

9.8.1 Overhead costs

Mine Geology (Salaries and Op Costs)
Mine Technical & Supervision (Salary and Op Costs)
Mine Services (Ventilation, Pumping, Workshops etc)
Power Costs

Overhead costs are calculated as a whole of mine cost and then are allocated to development and operating costs on an activity basis. For example in the initial development year (Production year -1) there is purely development with no significant ore production. Therefore 100% of the mine overhead costs are allocated to development. On the other extreme towards the end of mine life, there is little if any development and all overheads are allocated to production costs. In between we have an allocation based on the level of activity.

Mine Geology

Site geology costs are aimed at providing a full geological service to the mine and contractor, including a program of delineation drilling for stope definition and design. The proposed geological manning is:

- Supervising Geologist x 1
- Geologists x 2
- Technician/Drafts person x 1

An estimate for delineation drilling of \$25,000 per month based on some 200 metres month has been provide. Other costs involve labour, light vehicles, computer maintenance, computer software and general operating costs. Total costs are estimated at \$61,000 per month, i.e. \$732,000 per year.

Mine Technical & Supervision

In the initial years the underground mining work will be carried out by contractors but a small staff will be required to supervise and control the contractors.

The mining staff will consist of:

- Underground Manager x 1
- Senior Mining Engineer x 1
- Geotechnical/Mine Planning Engineer x 1
- Underground Superintendent x 1

The main emphasis will be on safety and safe working practices together with quality control, environmental compliance and general OH&S standards.

It is estimated that the staffing and operational costs including light vehicles, computing, consultants and other costs will amount to \$55,400 per month i.e. \$665,000 per annum.

For the Treat at Renison option an allowance has been made whereby these costs a doubled for three months at the beginning of "mine commissioning" to allow for contingencies when mine production begins.

For the Treat on Site option this allowance extends for six months.

Mine Services and Power Costs

These costs consist of items such as:

- Potable Water
- Operating Supplies (Safety, first aid, mines rescue, etc)
- Road maintenance
- Ventilation
- Pumping
- Electrical Maintenance
- Underground Communications
- Workshop, Mine Offices, Change Rooms
- Power

These costs vary as the size of the mine and the production rate change. They start at \$0.8 million per annum for the initial development year and increase to \$1.5 million per annum for full production at full mining depth.

As mentioned above these costs are allocated to both development and production depending on activity levels.

In this category, usually the major component from the above list is power. As an example the power component can be estimated as follows;

Surf Fans	2x 150	300
UG Fans	8x110	880
Jumbos/Drill rigs	3x180X30%utilisation	162
Pumps	60x6	300
	Total	1,642

Cost @\$0.06/ kw hr and 365 days per year = \$850,000/annum (approx.)

9.8.2 Mine Operating Costs

For the purposes of this study it is presumed that all mining will be done by contractors. Production costs have been taken from other owner operator studies and inflated by approx. 20% (10% margin plus 10% contingency) to reflect "expected" contractor costs.

Ore development at 4 m x 4 m and \$2,000 per metre is allocated directly to operating costs.

Unit operating costs are estimated at:

	\$/tonne of production
Fixed Costs (Super, Geology and Services)	5.89
Stoping Costs (\$10 per tonne stoped)	8.15
Ore Development	5.79
Ore Haulage	3.43
Support (Cable Bolts)	0.93
Support (Cemented Rock Fill)	3.00
	Total
	27.18

This when combined with the development cost of \$4.87 per tonne gives a total cost of \$32.05 per tonne.

10.0 MINE CAPITAL EQUIPMENT COSTS

Provided cost competitive underground contract rates can be achieved, then the Allegiance capital expenditure will be modest, and be confined to:

	\$000's
Surface Fans 150kwX2	400
Underground Fans 110kwX8	200
Main Pumps 90kw x 2	180
Pumps 30kW x 4	120
Electrical Substations x 2	200
Survey Equip	40
Computers and programs	50
First Aid	40
Mine Rescue	75
Vehicles x 4	200
	Total
	1,505

This cost has been included in the Mine Equipment Capital costs, \$0.8 million has been included in the pre-production year -1, and the residual \$0.7 million is included in production year 1.

11.0 METALLURGY AND MILLING

11.1 Summary

Mineralogical examination and metallurgical test work on drill cores has shown that the Avebury mineralisation is dominated by pentlandite and magnetite hosted by altered mafic and ultramafic rocks. Minor nickel arsenides, pyrrhotite, pyrite and chalcopyrite are also present.

Test work performed by Metcon Laboratories demonstrates that this mineralisation is amenable to concentration by flotation, with predicted nickel recoveries of 85-90% into 20-22% Ni concentrates. The concentrates are likely to contain 0.4-0.5% As and, whilst it may be possible to reduce this level, that will probably be achieved at a cost and at the expense of nickel recovery.

Allegiance is currently evaluating two options for treating Avebury ore:

- sell the ore to Renison for processing in the Renison Mill
- construct a dedicated mill at Avebury

The Renison Mill option involves no capital expenditure for Allegiance. Processing costs are under negotiation but are estimated Allegiance's consultant metallurgist John E Butler to be approximately \$19/t. Quotes have been received that indicate \$6.60/t for primary crushing at Avebury and transport to Renison.

The Avebury Mill on Site option involves an estimated capital expenditure of \$24M for the treatment mill and an estimated operating cost of \$17/t. These estimates also have been made by John Butler. This option undertaken on its own, would also delay first concentrate production by 18 months.

The Avebury Stage 1 (Viking Decline) development includes an extensive core drilling program. Mineralised intersections from this program will be subjected to extensive additional test work to assist with flow sheet and mill design for either the Renison or Avebury Mill options. Cross-cuts from the decline will also expose the mineralisation and provide small-tonnage bulk samples for further testing. The Stage 1 budget provision for this work is \$150,000.

11.2 Avebury Mineralogy

When Allegiance commenced drilling Avebury in 1997 (Information provided by Newhnam Exploration), samples from mineralised drill core intersections were routinely submitted to Wally Fander of Central Mineralogical Services for petrological and mineralogical examination. This data, which is systematically recorded with the drill logs, has collectively indicated the following:

- The Viking mineralisation is very similar to North Avebury.
- The mineralisation is iron rich and sulfur poor. The dominant sulfide is pentlandite often, but not always, associated with magnetite.
- Two phases of pentlandite are present - an early phase of large coarse aggregates and masses of pentlandite, and a later vein phase which cross-cuts the earlier phase.
- Minor amounts of nickel are present as the nickel arsenides nicolite, gersdorffite, ramelsbergite and safflorite.
- The mineralisation is relatively low in copper and cobalt.

Mineralogical examinations were also completed by Central Mineralogical Services and McArthur Ore Deposit Assessments on test work products from Western Metals.

11.3 Metallurgical Test Work

As previously indicated metallurgical test work has been undertaken on Avebury drill cores by Metcon, Western Metals and Renison, under the supervision of Allegiance's consultant metallurgist John E Butler.

11.3.1 Metcon testwork

To assist with preparation of the Avebury Scoping Study, three drill core intersections were submitted to Metcon Laboratories for preliminary test work.

Two intersections (A 018A and A 019A) were from North Avebury and one (A 014A) was from Viking.

Results of this work are presented in the report:

'Avebury Nickel Project Metallurgical Scoping Study for Allegiance Mining NL' December 2000 by Metcon Laboratories Pty Limited, Reference 6.

The Metcon data was in turn assessed and reported upon by John Butler in his review report also titled:

'Avebury Nickel Project Metallurgical Scoping Study for Allegiance Mining NL' December 2000 by John E Butler, Reference 7.

John Butler listed the principal conclusions of the Metcon work as follows:

- (i) Of the three drill cores examined A 018A was found to have a significantly higher grinding hardness than A 014A and A 019A. A bond ball mill work index of 18.4 kWh per tonne of ore was determined with a composite derived from A 018A and A 019A.
- (ii) Only sample A 019A was tested for heavy media separation response, and it proved to be non-beneficial with respect to weight rejection and pre-concentration.
- (iii) The three samples were very amenable to flotation treatment, giving extremely acceptable and encouraging nickel recoveries and concentrate quality.
- (iv) A straightforward flotation reagent regime, including sodium isobutyl xanthate collector, copper sulphate as a pentlandite activator, and methyl isobutyl carbinol frother appears adequate, with probably the addition of carboxy methyl cellulose being of value for gangue depression.
- (v) Flotation circuit optimisation would almost certainly enhance flotation response even further.
- (vi) The high natural pH of flotation feed slurry, at approximately 10.0, was an additional positive property as most nickel sulphide ores require an alkali, such as burnt lime, to adjust the pulp to the required pH level.
- (vii) Although the primary grind size distribution was not optimised it was shown that the 80% minus 75 microns level used in flowsheet development gave improved nickel recoveries as compared to those at an 80% minus 106 microns grind.
- (viii) A simple roughing/scavenging/two stage cleaning flotation circuit appears to be adequate.
- (ix) Regrinding of rougher/scavenger concentrates ahead of cleaning may be beneficial, but has not been included in the preliminary flowsheet.
- (x) The above mentioned possible flotation reagent addition of carboxy methyl cellulose may be invaluable in minimising the magnesium oxide content of saleable concentrate, this being a compound which at high levels is less than popular in nickel smelter feedstock and it has been allowed for in the adopted flowsheet.
- (xi) Cobalt recoveries are virtually identical with those for nickel in the flotation system developed.
- (xii) In the locked cycle test, including six cycles and the recycling of cleaner tailings within the system, very satisfactory response was achieved. It was sufficient to give confidence that at a 1.6% Ni ore head grade, a 22% Ni concentrate with a 0.19% tailings is readily achievable.
- (xiii) Due to the limited weight availability of suitable concentrate product no settling or filtering tests were undertaken, but from past experience it is obvious that it will not give any operational difficulties.

On the basis of the Metcon results, John Butler also developed a conceptualised mill flow sheet for Avebury and estimated (at a Scoping Study level) capital and operating costs of \$18M and \$19/t respectively for a 300,000 tpa mill.

11.3.2 *Western Metals testwork*

In early 2003 Allegiance entered into negotiations with Western Metals for the treatment of Avebury ore through the Hellyer Mill which had been on care and maintenance for 2 years. As part of these negotiations, Western Metals agreed to undertake test work on a composite sample of half drill core obtained in drill hole A 026A through the Viking deposit.

Results of their work, undertaken in their Burnie laboratories, are presented in report:

'Preliminary Flotation Test Results. Avebury Nickel Sulfide Project Drill Hole A 026A' May 2003 by Western Metals Limited, Reference 8.

John Butler (memo dated 25 May 2003) commented on the Western Metals results as follows:

"Five froth flotation tests have been completed; (1) Prefloat followed by roughing, (2) Cleaner test without rougher concentrate regrinding, (3) Repeat of test (2), (4) Cleaner test with rougher concentrate regrinding, (5) Repeat of test (4) with addition of a dispersant ahead of cleaner flotation. The important preliminary findings were that a flotation feed grind of about 80% passing 60 microns is advantageous as compared to the Metcon Laboratories recommended 80% passing 75 microns, a prefloat stage is of no value, approximately 80% nickel recovery was achieved at a concentrate nickel grade of about 20%, with an arsenic level in concentrate of the order of 0.5%. Mineralogical work on drill core feed material has been carried out by McArthur Ore Deposit Assessment (MODA), and Central Mineralogical Services (Wally Fander) have completed evaluations of both drill core feed and selected concentrates."

Because of both the subsequent decision by Allegiance to focus on negotiations with Renison, and the corporate demise of Western Metals, no further test work was undertaken by Western Metals.

11.4 **Renison Testwork**

In April 2003, Renison expressed an interest in processing Avebury ores. To assist and advance negotiations with Renison, they were provided with the other half of the A 026A drill core sample given to Western Metals, for test work in their laboratories at Renison Bell.

Unfortunately, their test work was prematurely halted when the Renison Mine closed and the Company was placed in voluntary administration.

However, sufficient work was completed (but not reported upon) for John Butler (memo dated 25 May 2003) to comment as follows:

- To date Renison have only completed two froth flotation tests, the first being a refloat/rougher concentrate evaluation and the second a roughing exercise without a prefloat stage.
- Renison advised that a prefloat operation is not warranted, thus arriving at the same conclusion as both Metcon Laboratories and Western Metals.
- Renison metallurgists have assembled data which indicates an 87% nickel recovery at about a 20% nickel concentrate grade. However, supporting test work data was not available prior to the cessation of work.
- Results indicate arsenic levels of the order of 0.5% in the high grade nickel concentrates.

11.5 Processing

Initially, a range of processing options were considered:

- Avebury Mill
- toll treat at Hellyer
- toll treat at Renison
- process at Renison on a cashflow sharing basis

Following a combination of negotiations between parties, and corporate developments with both Renison and Western Metals, it was agreed that the two most likely options were an Avebury Mill and processing at Renison on a cashflow sharing basis.

The Indicative Feasibility Study focuses on these two options and quantifies their commercial outcomes.

11.6 Avebury (on-site) Mill

The Avebury Scoping Study completed in 2001, conceptualised a 300,000 tpa Avebury Mill.

This Indicative Study envisages a 400,000 tpa mill.

Process description

The following process description and simplified beneficiation flow sheet was provided to BFP by consultant metallurgist John Butler. It is based on the metallurgical test work described above. Detailed Stage 1 test work may result in modifications.

Avebury nickel sulphide bearing ore is very responsive to relatively straightforward and efficient nickel concentrate production, as illustrated in the Simplified Beneficiation Flowsheet.

Although subject to possible minor modifications, after completion of planned future large scale testwork, it is envisaged that processing will consist of the following steps:

- (i) Comminution of run of mine (ROM) ore in a primary crushing, semi-autogenous grinding (SAG), ball milling sequence to produce a froth flotation circuit feed ground to 80% passing 75 microns.

The jaw crusher would be in open circuit and designed to produce a top size of about 150 mm, the SAG mill would also be in open circuit to further reduce the ore to some 80% minus 12.7 mm, and comminution would be completed in a closed circuit ball mill/hydrocyclone combination for the preparation of a froth flotation feed approximating 80% passing 75 microns. Consideration would be given to eliminating the installation and cost of a ball mill, by running the SAG mill in closed circuit with hydrocyclone classification.

A ball mill work index of 18kWh/DMT was determined in the Metcon Laboratories testwork, based upon producing an 80% minus 106 microns froth flotation feed, but as it is now considered that a slightly finer grind to approximately 80% passing 75 microns would be advantageous a work index of at least 20kWh/DMT, say 22kWh/DMT, should be adopted in any preliminary estimates.

- (ii) Roughing/scavenging froth flotation, with the tailings being a disposable product and the concentrate being subjected to two froth flotation cleaning stages for the preparation of a final 20-22% nickel concentrate.

Froth flotation parameters emanating from the Metcon Laboratories program include the following:

	<u>Laboratory</u>	<u>Recommended for Plant Design</u>
Rougher/scavenger flotation	15 minutes	45 minutes
Cleaner flotation	16 minutes	48 minutes
Rougher/scavenger flotation reagents	80gpt SIBX 50gpt MIBC 400gpt CuSO4	As per laboratory As per laboratory As per laboratory
Cleaner flotation reagents	10gpt SIBX 10gpt MIBC	As per laboratory

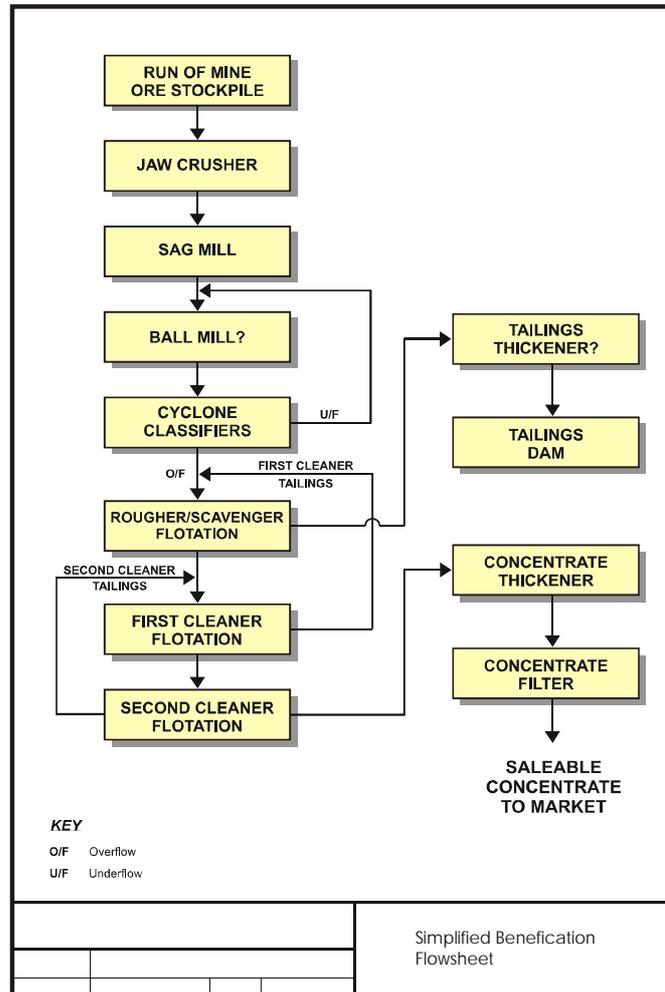
- (iii) Tailings thickening ahead of storage in a tailings dam.

No quantitative concentrate thickening and filtration data have been determined, but cursory visual inspections strongly suggested that they will not afford any problems and will respond effectively in a straightforward system. It is likely that high rate thickening would be implemented, with the choice of either vacuum or gravity filtration being made after evaluating such factors as capital and operating costs, saleable concentrate moisture content, etc.

- (iv) Second/final cleaner concentrate thickening and filtration prior to despatching the saleable product, at about 8% moisture, to an overseas smelting/refining organisation.

Whilst it may be possible that the ball milling and tailings thickening stages may prove to be unnecessary, it is considered expedient to include them in the current study's capital and operating costs evaluation.

Table 11.1 – Simplified Benefication Flowsheet



The Avebury Mill option envisages an on-site tailings dam. However, the disposal of Avebury tailings presents several technically and commercially attractive options. Metallurgical test work suggests Avebury tailings will be alkaline, not acidic. Three disposal options are possible:

- on-site above ground in a dam
- below ground as fill
- off-site

Off-site disposal may present options to dispose of the tailings either at neutral cost or for a profit if they can be used for acid neutralisation on other operations or sites.

Capital cost estimate:

The capital cost estimate below is based on industry precedent and anecdotal data from elsewhere in Australia for similar operations, and professional experience in the industry. It is not based on detailed engineering design or quotation.

The estimate includes a lump sum for an on-site tailings dam.

A.	
Comminution equipment (jaw crusher, SAG mill, ball mill)	\$3,600,000
Flotation machines, conveyors, motors, slurry pumps, screens and piping	\$1,950,000
Miscellaneous tanks (surge tanks, conditioners, etc)	\$350,000
Concentrate and tailings thickeners and concentrate filter	\$1,250,000
Sub-total:	<u>\$7,150,000</u>
B.	
Equipment, piping and electrical installations, instrumentation, process and auxiliary buildings, plant services (compressors, water pumps, etc), site preparation. Factored as Sub-total (A) x 1.21	\$8,655,000
Sub-total (B):	<u>\$15,805,000</u>
C.	
EPCM. Factored as sub-total (B) x 0.15	\$2,375,000
Sub-total (C):	<u>\$18,180,000</u>
Contingency. Factored as Sub-total (C) x 0.10	\$1,820,000
D.	
Tailings dam	\$3,000,000
TOTAL:	<u>\$23,000,000</u>

For the purposes of the economic evaluation the Capital Cost of the traetmil mill for the Mill on Site option has been assumed to \$24,000,000 - this allows an additional \$1,000,000 for errors and omissions.

Operating cost estimate(see Table 11.2 below).

Based upon treatment of 400,000 tpa (dry) ore:

Table 11.2 – Operation Cost Estimate

	Unit cost -\$/dry t ore
Labour 1 x metallurgical supt 1 x general foreman 4 x senior operators 4 x operators 4 x day crew/relief/crushing 1 x maintenance foreman 5 x tradesmen 1 x junior metallurgist	4.48
Power (40 kWh/dry t ore)	4.00
Liners and grinding media	2.80
Chemical Reagents (copper sulphate, sodium isobutyl xanthate, methyl isobutyl carbinol, carboxy methyl cellulose and flocculant)	2.07
Maintenance materials (4% of capital cost Sub-total [B])	1.39
Tailings dam operations	1.26
Miscellaneous (ROM ore loader operation, assays, office supplies, environmental monitoring, communications, computing, training, site vehicles, safety/first aid/firefighting, concentrate bagging, etc)	1.50
Total: (For the economic analysis an additional 10% has been allowed to cover contingencies, errors and omissions - this results in a rounded cost of \$19 per tonne)	17.50

11.7 Renison Mill

This option provides for the transport of 400,000 tpa of Avebury ore to Renison for processing, and shipment of bulk concentrates through the port of Burnie to a smelter.

Current negotiations with Renison entail processing the ore for a fixed price/t and marketing the concentrates through a jointly owned Company (Salco) which would distribute profits after deductibles to Allegiance and Renison.

Allegiance engaged consultant metallurgist Ron Goodman to provide an independent opinion on both the suitability of the Renison Mill to perform this task and an estimate of costs. His findings are presented in a report titled:

'Conceptual Metallurgical Studies - Nickel Ore Processing Tasmania' dated 06 August 2003, prepared for Allegiance Mining NL by Ron Goodman of Devlure Pty Ltd, Reference 9.

This report considered both batch processing and dual processing Avebury ore in conjunction with Renison tin-ore. It did not deal with operating Renison as a nickel only mill.

The summary conclusions from Ron Goodman's report for these two Renison sub-options are reproduced below:

“Batch treatment of nickel ore

This can be achieved through the present equipment if primary crushing is done by Allegiance.

The main modifications required to the plan are:

- Receival pad for ore
- Addition of a pressure filter for final concentrates de-watering
- Primary Cyclone internal changes to achieve grind size of 106 or 75 microns
- Routing of sulphide flotation tailing to final tailings pump - pipe work
- Pipe work to use tin flotation cleaners and re-cleaners for nickel
- Supply of lime and other reagents to the nickel flotation circuit
- New On-stream-analysis probes to measure three pulp streams for circuit control

To treat 400,000 tonnes per annum it is estimated that this could take 33 weeks in total as the ore is a little harder than Renison ore, the grind size required for liberation is finer, therefore the grinding rate will be lower. It has been assumed that nickel ore can be processed at the rate of 1700 tpd, say 70 tonnes per hour. Renison were processing at the rate of 2000 tpd prior to closure, say 83 tonnes per hour.

Operating costs for Renison have been estimated at approx. \$17 tonne. Allegiance also needs to add the cost of primary crushing at their mine, transport to Renison and a toll treatment fee to be levied by Renison if this is the commercial manner in which the processing will be operated.

The **capital cost** for the above is assumed to be approx. \$1 to \$1.5 million, the major item being the pressure filter. However some suppliers are prepared to offer such units on lease basis with a buy back arrangement. Detailed study work would be required to get a better figure than this.

In considering any arrangement with Murchison United NL or other parties, it is assumed that plant maintenance may have been neglected for 2 or 3 years and may need to be brought back to standard. The question is who pays for this? It will depend on the nature of the arrangement but in normal toll treatment, the client would pay on a cost per tonne basis which would include a maintenance charge, however, the basic premise is that the plant be in good condition at the start of the exercise.

In regard to the crushing plant at Renison, prior to closure the management were looking at a scheme to relocate the secondary and tertiary crushers, and eliminate the 4000 tonne fine ore-bin and associated conveying system. This scheme should offer

considerable savings in operating costs, as there are some 17 conveyors in the circuit. The down side is that they will have much less fine ore storage in bins (1000 tonnes) and may have to crush on more shifts.

The schematic flow sheets, design parameters and operating cost tables contained in this report show the writers assumptions in support of the above comments. It should be borne in mind that these are conceptual, first pass attempts and treated as such.

It should be noted that if these assumptions are correct, and it takes 33 weeks to process 400,000 tonnes of Allegiance ore then there is only 19 weeks left to process Renison ore. At 2000 tpd means Renison can only treat 266,000 tonnes of tin ore per annum - therefore the proposed premise to treat 400,000 tpa of nickel ore and 400,000 to 500,000 tpa of tin ore cannot be achieved on a batch basis and other annual treatment rates need to be considered.

The effect on the metallurgy and handling of the nickel ore in regard to oxidation when stockpiled needs to be studied for cases of run-of-mine primary crushed and fine crushed.

Dual processing

In the case of Dual processing of tin and nickel ore, more crushing and/or grinding equipment would need to be added. For example a SAG Mill could be installed to accept the Allegiance primary crushed ore. There appears to be sufficient spare flotation cells at Renison to allow parallel flotation to take place, and there should be one spare regrind mill for use in the nickel circuit as the sulphide content of Renison ores is much lower than what the plan was designed for. Some of the spare flotation cells need refurbishing and recommissioning. An alternate SAG Milling is for Allegiance to carry out 2 or 3-stage crushing at their mine and install a Primary Ball Mill at Renison.

In dual processing 500,000 tonnes of tin ore and 400,000 tonnes of nickel ore could be processed, however the quantity of tailings being produced would increase by 200,000 tpa which would mean either upgrading of the present pump station or addition of an extra pump station to carry nickel tailings.

Summary

The major items to provide for Dual processing would be:

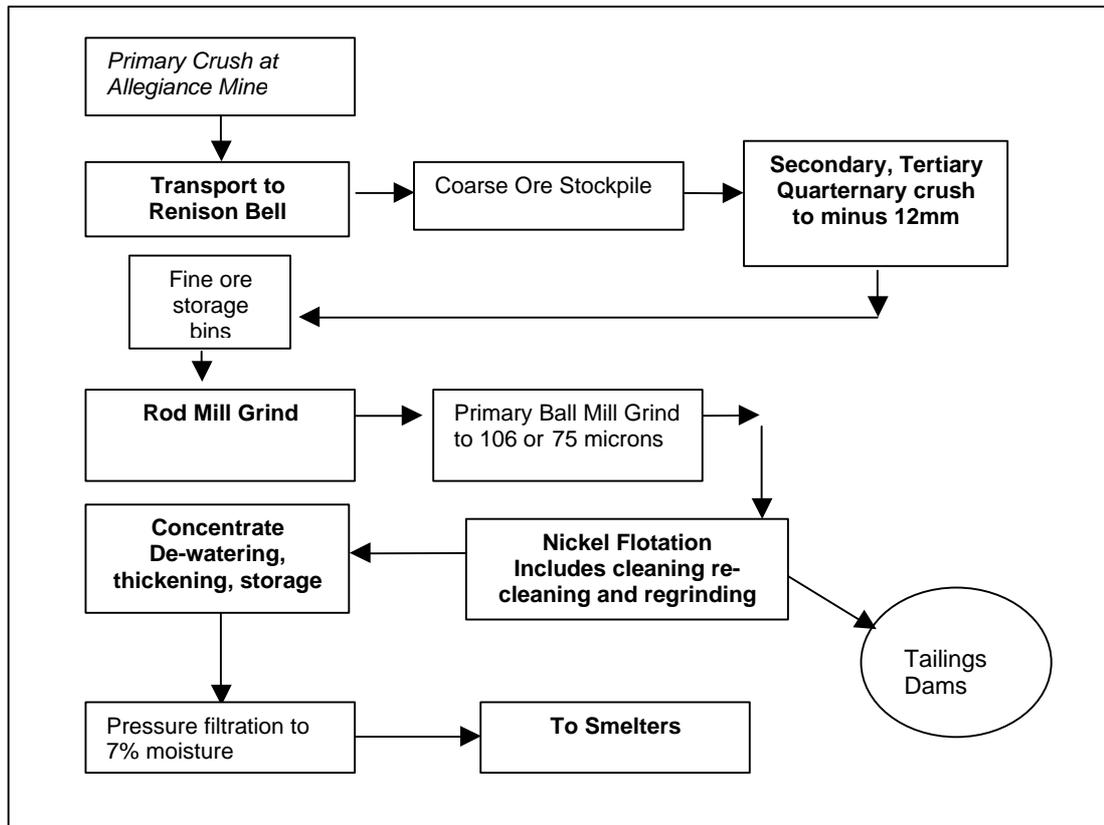
- Primary or fine crushing by Allegiance at the mine
- A stockpile and receiver pad for ore
- A Grinding Circuit - could be SAG or Ball Mill depending on how much crushing is done at the Allegiance mine
- Refurbishment of flotation plant and associated pumps and pipe work - this plant is now redundant for Renison tin ore processing
- Circuit modification to use one of the Renison sulphide regrind mills
- Relocation of a Renison drum magnet to remove magnetite from the nickel - either pre- or post flotation
- Refurbishment of a thickener to receive nickel concentrates

- Reagent feeding system for lime and other reagents for nickel flotation - lime supply is available as part of the Renison acid leach process
- Addition of on-stream analysers to measure nickel on-line - 3 probes
- Installation of a filter press
- Upgrading of tailings disposal system or addition of a new pump station

The cost of these options needs more study but may be in the order of \$3 to \$5 million depending on whether new or used equipment is employed, and whether purchased or leased, for example the filter could be leased - detailed engineering studies must be made.”

Ron Goodman also presented in his report a recommended flow sheet for the Renison Mill to process Avebury ore (see Figure 11.3 below).

Figure 11.3 – Renison Mill Processing Avebury Ore



Allegiance currently favours road delivery of primary crushed Avebury ore to Renison for dual processing in the Renison Mill at a throughput rate of 400,000 tpa (other delivery options were discussed in the Infrastructure section above).

An indicative estimate for crushing, loading and road transport of Avebury ore to Renison is \$6.60/t. It is probable that competitive tendering during Stage 1 for this operation may see a reduced cost.

An allowance of \$1.5M has been provided for elsewhere for upgrading the Trial Harbur Road.

In this option, the **capital cost** of the on-site mill is avoided but an allowance of \$4M is made for converting and refurbishing a portion of the Renison Mill. This cost is indicative only, but is in accordance with estimates in Ron Goodman's detailed report.

Process operating costs have been estimated by Goodman as \$17/t at Renison. This is in close agreement with estimates provided by Renison personnel (Newnham - pers comm).

Because the cashflow sharing scheme is based on Renison being responsible for all site administration, environmental and capital expenditures, including equipment replacements and modifications, a total Renison operating cost of \$21/t has been adopted for financial modelling of this option.

11.8 Concentrate Transport

Both the Avebury Mill and Renison Mill options will result in the production of approximately 25,000 wet tonnes pa of concentrate, containing 22% nickel and 7-8% moisture.

In the Avebury Mill option, this concentrate would either be trucked to the Melba Flats concentrates depot and then rail freighted to the Port of Burnie concentrates shed, or trucked direct from Avebury to Burnie.

In the Renison Mill option, the concentrates would be either rail freighted from Renison to Burnie or trucked direct from Renison to Burnie. If rail freighted, Renison would be responsible for developing a rail loading facility at Renison.

At Burnie, concentrates would be loaded into ships by the bulk loading facility owned by Tasrail.

In the economic modelling in this Indicative Study, all ex-mine costs in the Avebury Mill option are attributed to Allegiance and in the Renison Mill option to the jointly owned company, Salesco.

12.0 CONCENTRATE MARKETING

Indicative concentrate assays based on the preliminary metallurgical test work completed by Metcon were as follows:

	%	ppb
Nickel	22.0	
Cobalt	0.5	
Copper	0.15	
Au		1821
Ag		<1000
Pt		<2
Pd		20
Iron	28.9	
Sulphur	27.8	
SiO ₂	9.6	
Al ₂ O ₃	0.3	
CaO	1.1	
MgO	4.3	
TiO ₂	0.01	
Na ₂ O	0.01	
K ₂ O	0.05	
P ₂ O ₅	0.03	
MnO	0.11	
As		4,640
Ba		13
Bi		267
Cd		<5
Cr		1310
Mo		75
Pb		397
Sb		160
Sr		<10
V		16
Zn		537
Zr		22
Nb		0.9
Sc		0.9
Se		17.8
Sn		1.2
Ta		0.7
Te		1.8
W		9.1
Hg		0.2
Cl		300
F		220

The operation detailed in this Indicative Study provides for the following concentrate outputs:

-	concentrate dry tonnes	21,158 tpa
-	concentrate wet tonnes	22,850 tpa
-	concentrate grade	22% Ni
-	life of mine	10 years

This production will be road or rail freighted to the Port of Burnie for bulk loading into ships for transport to a smelter.

12.1 Indicative smelter terms

Four major smelters of nickel sulfide concentrates were requested by Allegiance to provide indicative terms for the purchase of Avebury concentrates based on the above chemical and physical specifications.

Each of these smelters indicated a willingness to purchase the output and provided indicative terms. These were comparatively assessed by John Butler and BFP, and the most favourable ones utilised in the financial analysis in this report.

The three chemical elements of potential concern were arsenic, bismuth and magnesium oxide. The indicative smelter terms received suggest that provided these can be maintained below 0.5%, 300 ppm and 4% respectively, no (or only minor) penalties will apply. The preliminary test work by Metcon, Western Metals and Renison suggest these targets should be attainable.

12.2 Off-take Agreement

The Stage 1 development Business Plan envisages that an off-take agreement for the purchase of Avebury concentrates will be negotiated with a smelter ahead of the preparation of the Definitive/Bankable Feasibility Study.

13.0 ENVIRONMENTAL MANAGEMENT

13.1 Avebury Environmental Setting

The Avebury identified mineral resource is overlain by a cool temperate rain forest, and dissected by several small streams. The topography is moderately rugged.

To the north of the resource area, and south of the Trial Harbour Road, the landscape is flatter, covered by low scrub and eucalypt patches, and cut by several small creeks occupying shallow gullies.

The area is managed ('owned') by Forestry Tasmania and classified as *Multiple-Use State Forest*, which means Forestry Tasmania must manage the area in a manner which facilitates the responsible development of a range of land use activities, including exploration and mining.

An informal stream-side reserve exists along Hemp Creek. The multiple-use State Forest east of Comstock Creek, ie, east of Avebury, is currently classified as having high quality wilderness values.

The Avebury deposits lie within the West Coast Council Municipality in an area designated a *Resource Development (Natural Resources) Zone* within their Planning Scheme.

The Avebury area has been substantially affected by previous events. The rain-forest areas overlying the deposit were logged for minor species in the 1950s and 1960s. The flat area between the deposits and the Trial Harbour Road was also logged during this period and later burnt in the early 1980s. Both areas are cut by numerous old bulldozer tracks developed for logging.

Since 1997 a series of 4WD tracks have been established over the Avebury area to facilitate exploration drilling.

The Avebury deposits do not outcrop and it is envisaged that all ore extraction will be by underground operations.

13.2 Environmental Policy & Strategic Management

Allegiance is committed to the development of Avebury in accordance with the principles of best practice environmental management, as defined in the *Environmental Management and Pollution Control Act 1994* (EMPCA). In the case of Avebury, this is interpreted to mean:

- (i) Avebury will be managed so as to achieve an ongoing minimisation of environmental harm through cost-effective measures assessed against current international and national standards applicable to the activity.
- (ii) Best practice environmental management will require:
 - strategic planning of all development
 - implementation of administrative systems
 - a public consultation process
 - waste management

To give effect to these BPEM principles, Allegiance has developed an Environmental Policy for the Avebury Project which reflects the Company's commitment to managing its activities in an environmentally responsible manner.

ALLEGIANCE'S ENVIRONMENTAL POLICY

- Ensure that employees and contractors are informed about this policy and made aware of their environmental responsibilities in relation to Allegiance's activities.
- Require all contractors to comply with Allegiance's policies.
- Comply with this policy and applicable legislation, regulations and policies and strive for best practice.

- Implement sound environmental management systems so as to minimise the effect of Allegiance's activities on the environment.
- Ensure sufficient resources are allocated to environmental management and provide relevant training and support for personnel to fulfil their environmental responsibilities.
- Keep the community informed on a regular basis of Allegiance's activities and consult with the community in relation to Allegiance's operations.
- Seek continuing improvement through monitoring, review, auditing and reporting.
- Rehabilitate areas disturbed as defined in the applicable environmental management plan.

13.3 Environmental Approvals Process

The approvals process was outlined in detail in Section 3 above.

Before development can commence at Avebury, Allegiance must obtain both a Mining Lease from Mineral Resources Tasmania and a land use permit from the West Coast Council.

The environmental management requirements for the project are largely detailed in the land use permit and will incorporate inputs from Forestry Tasmania (as the land owner), Department of Primary Industry & Water Management, and the West Coast Council (reflecting planning and issues of public concern).

The duration of the approvals process reflects the complexity of the project and the identified issues but is unlikely to be less than 4 months.

The processes for Avebury requires the following steps:

- Permitting for Stage 1 (evaluation) decline development
- Environmental Management of Stage 1
- Permitting for Stage 2 (production) development
- Environmental Management of Stage 2
 - (a) Renison Mill option
 - (b) Avebury Mill option

13.3.1 Permitting for Stage 1 decline development

The Stage 1 Viking Decline development was assessed by the State Government as a Level 2 activity which required presentation to the West Coast Council of a Development Application, supported by a Development Proposal and Environmental Management Plan (DPEMP) prepared in accordance with guidelines from State Government.

The DPEMP was prepared for Allegiance by NSR Environmental Consultants and presented, along with a Development Application to the West Coast Council on 26 June 2003. The Application was published on 16 August 2003 and will be subjected to public comment until 15 September 2003.

13.3.2 *Environmental Management of Stage 1*

The Stage 1 DPEMP requires Allegiance to:

- prepare an operating Environment Management Plan (EMP) prior to the commencement of Stage 1
- undertake various environmental monitoring programs during Stage 1
- undertake various OH & S/environmental monitoring programs during Stage 1

The operating EMP will reflect conditions attached to the land use permit and will include flora and fauna surveys, aboriginal heritage and historic heritage surveys, and various management strategies such as fire and weed management.

The EMP will be a Stage 1 operational manual.

Budget provision **\$40,000**

Environmental monitoring and reporting programs during Stage 1 will principally address water quality. Routine sampling of streams will be undertaken and results reviewed by NSR.

Budget provision **\$40,000**

OH & S monitoring programs during Stage 1 will focus on monitoring air quality with particular emphasis on respirable asbestos and silica determinations. Management strategies will be determined by results of these programs.

This work will be designed, initiated and evaluated by a qualified occupational hygienist.

Budget provision **\$70,000**

The total budget provision for environmental and OH & S management for Stage 1 is \$150,000.

13.3.3 *Permitting for Stage 2 (Production) Development*

To advance Avebury from Stage 1 into Stage 2 (full mine production), the permitting process will have to be repeated. A Stage 2 DPEMP will have to be prepared and submitted to State and Local Governments for approval.

To avoid a significant time gap between Stage 1 and 2 and reflecting the anticipated 6-month permitting period, it is proposed that work commence on the Stage 2 DPEMP as soon as Stage 1 decline development has commenced, and to have it submitted to Government before 6 months of the completion of Stage 1.

The content and complexity of the Stage 2 (production) DPEMP will be determined by which milling option is selected. Some components of the study will be common, others will be mill option specific.

Common components

- mine development
- waste rock disposal

Mill Option specific components

- access road developments
- mill development
- tailings disposal
- water and power requirements
- infrastructure buildings
- waste management

It is assumed that the cost of preparing the Stage 2 DPEMP will be the same for both options. In the case of the Renison option, a major cost component will be ore-transportation study, whilst in the case of the Avebury mill option, a major cost component will be the mill and tailings studies.

Budget provision for the Stage 2 DPEMP is \$150,000

13.3.4 Environmental Management of Stage 2 (Production)

The Avebury production stage, whether it be at a Renison or Avebury Mill, will require preparation of an operating EMP which reflects the Stage 2 land use permit conditions.

During production, various environmental and OH & S monitoring and reporting programs will have to be implemented.

In the **Renison Mill** option these programs will be focused on the mine, waste rock disposal and access. A full time environmental officer regularly supported by consultants will be required.

Budget provision is \$0.75M pa or \$1.87/tonne

In the **Avebury Mill** option, additional programs will be focused on the mill, tailings disposal and outcomes of a larger workforce.

A full time environmental manager supported by technical staff will be required to manage these programs.

Budget provision is \$1M pa or \$2.50/tonne

14.0 FINANCIAL ANALYSIS

14.1 Summary

NB: when undertaking this analysis no allowances, other than specifically highlighted, have been made for the contingencies. The analysis has been undertaken with the greatest care but information numerical conclusions should be considered as indicative.

A variety of options have been evaluated (Details in Section 8 – Treatment). Alternates such as “Milling at Hellyer”, “Toll Milling at Renison” and “Purchasing Renison” were eliminated and the preferred options are:

- Mill at Site 0.4 MTPA, and
- Mill at Renison 0.4 MTPA (based on a Cash Flow Sharing Option “CFSO”)

These two options are the most realistic combining higher throughput (0.4 MTPA) with lower grade (approx. 1.4% Ni). This higher tonnage option is supported by a resource based at a 0.7% Ni cut-off of 4.06 Million tonnes at 1.5% Ni.

This average grade represents approximately 10% dilution at a 0.7% Ni dilutant grade. There is a wide zone of mineralisation between the 0 to 1% Ni cut-off, and according to McKeown, observations of the grade within this zone indicate that a 0.7% dilutant grade is appropriate.

The presence of higher grade resources near the top of the deposit (Table 13.3) allows higher grade production, particularly in the initial years. This has been assumed in the model.

This option yields the following results:

Table 14.1 – Summary of Preferred Options

Option	MTPA	Grade (avg)	Pre Prod Capital	Pre Tax NPV@8%	IRR	Max Neg Cash	Total Cost (Inc smelt)
		% Ni	\$M	\$M	%	\$M	US\$/lb
Mill at Site	0.4	1.4	29.8	69	52	32.4	2.31
Mill at Renison 90:10 split	0.4	1.4	4.8	74	240	5.6	2.44

Nickel Price \$US8950/t, Exchange Rate: A\$:US\$, 0.66

NOTE: The CFSO option presumes a Renison mill capital improvement cost (i.e. Approx. \$4M upgrade.) and a subsequent 90% Allegiance 10% Murchison split based on cashflow.

These options represent rates of return exceeding 50% with the “Mill at Site” option giving an NPV@8% of \$69 million compared with the “Mill at Renison” NPV of \$74 million.

The "CFSO" option allows a lower capital \$4.8 million against \$29.8 Million for "Mill at Site" and a substantially higher rate of return of 240%. This lower capital and higher rate of return may be considered more attractive especially when combined with the ability to scale up the Renison plant at minimal cost if this option is available with favourable economic terms. The maximum negative cash position is a \$5.5 million for the CFSO option against \$32.4 million for the "Mill at Site" option.

The cost of the Stage 1, Exploration Decline (\$7.3M), is considered as Risk Capital and is not part of the economic evaluation above. Spreadsheets have however been constructed with these costs included should they be required for examination. They effectively show correspond changes to both maximum capital draw-down and overall NPVs.

The Renison option lowers the capital investment and therefore risk, however this can only occur if a suitable financial arrangement can be made with the owners of Renison milling facility.

Table 14.2 - Comparison of Rate of Return for different Cashflow Splits for Renison Mill Capital of \$4 Million.

Renison Capital \$6M					Renison Revenue & Rate of Return				
Allegiance Revenue & Rate of Return					Renison Revenue & Rate of Return				
Split	Pre Tax		Revenue	Cash	Split	Pre Tax		Revenue	Cash
	NPV@8%	IRR				NPV@8%	IRR		
%	\$M	%	\$M	\$M	%	\$M	%	\$M	\$M
90.0%	73.9	240%	32.2	14.0	10.0%	7.7	39%	10.4	1.2
87.5%	71.2	232%	31.8	13.5	12.5%	10.6	48%	10.8	1.5
85.0%	68.6	224%	31.3	13.0	15.0%	13.4	56%	11.3	1.7
82.5%	66.0	216%	30.8	12.5	17.5%	16.3	65%	11.8	2.0
80.0%	63.3	208%	30.3	12.1	20.0%	19.2	72%	12.3	2.3
77.5%	60.7	200%	29.9	11.6	22.5%	22.0	80%	12.7	2.6
75.0%	58.0	192%	29.4	11.1	25.0%	24.9	87%	13.2	2.9

The "CFSO" offers better rates of return and allows an earlier start date of Qtr 2, 2005. Provided encouraging results are being achieved in the early stages of the Stage 1 development, the Renison mill could be converted in the last six months of 2004. This may allow commissioning in Qtr 1, 2005 with full production schedule for Qtr 2, 2005.

As previously discussed a significant consideration will be the upgrade of the Trail Harbour road. Time lost on this upgrade will push back the commissioning time for the Renison option and bring the actual start-up time for the two options closer together.

The "Mill at Site" option due to the capital expenditure required for the treatment plant would not start commissioning until Qtr 2, 2006 with full production scheduled for Qtr 3, 2006. This is approx. 15 months behind the Renison option however "protection" of the nickel price and exchange rate could occur when an ore reserve is determined. ie approx. Jan 2005.

The sensitivity of the project has been assessed for both the "Mill at Site" option and the "CFSO". The results are illustrated in figures 14.2 and 14.3. The project options are sensitive to metal prices and throughput rates. Metallurgical recovery, exchange rate and grades follow, with the project least sensitive to capital and operating costs.

Considering the Mill On Site project's negative sensitivity, based on a 10% variation of any one parameter, of a minimum NPV of \$40M and an ROR of 35% has been calculated. This occurs when metal price is reduced by 10%. Considering that it is possible put in place metal price and exchange rate protection, the most sensitive variable is grade or recovery. Considering a 10% negative sensitivity of either of these items the project yields an NPV of \$52 million at a ROR of 45%.

If the two sensitivities are of grade and recovery are combined at a figure of -10%, the NPV is still positive at \$36M and the ROR is 37%.

The "Treat at Site" option, the more capital intensive of the two options, is robust if Metal Price and Exchange Rate hedging is put in place.

Figure 14.2 – Graph of Mill at Site NPV Sensitivity versus Assumptions

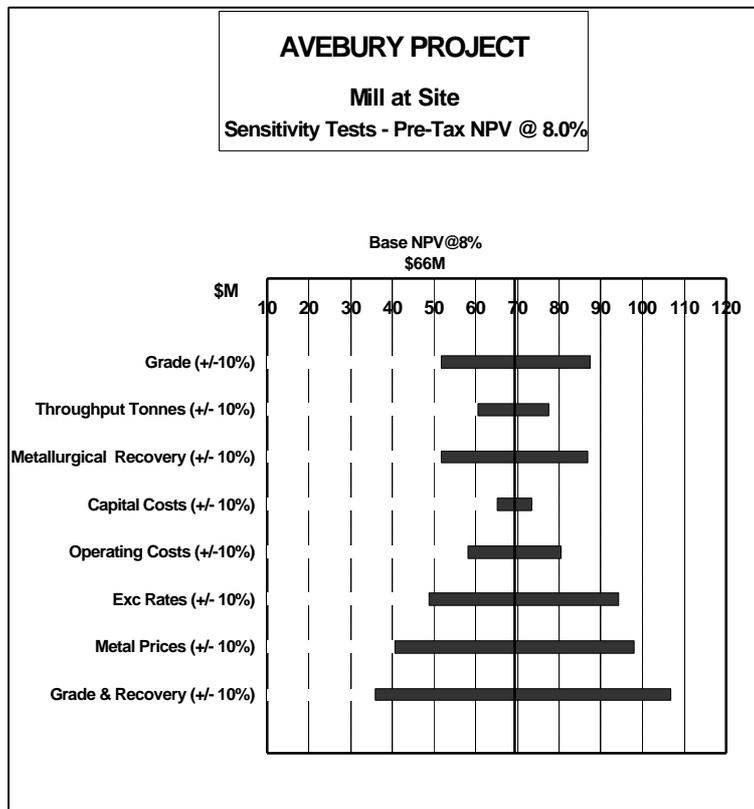
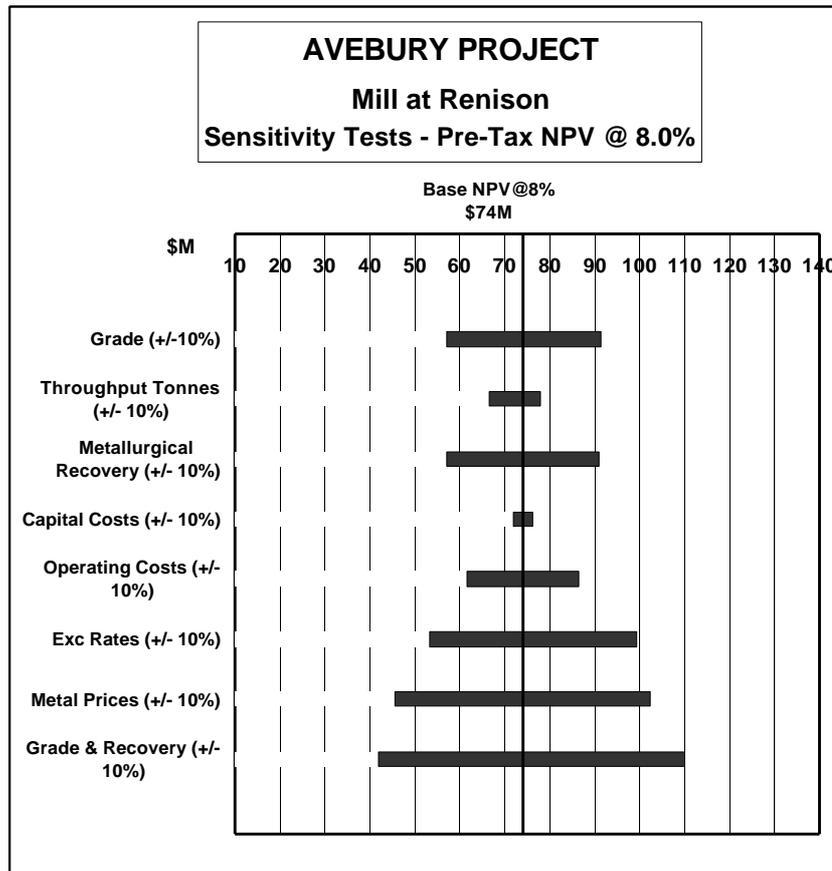


Figure 14.3 – Graph of Mill at Renison NPV Sensitivity versus Assumptions



14.2 Model Assumptions

The model assumptions are summarised in table 14.3 below.

Table 14.3 – Model Pre Tax NPV's and Assumptions

Avebury Nickel Project Pre Tax NPV's and Assumptions Lower Grade Model Grade 1.4% Ni			A1	A2	A2	A2
			Mill at Site	Mill at Renison Selco	Mill at Renison Allegiance	Mill at Renison Renison
			0.4MTPA	0.4MTPA	0.4MTPA	0.4MTPA
Revenue Split (Based on ROR on Capital)				100%	90%	10%
Valuation						
Pre Tax	NPV@8%	\$M	69.3		74.0	7.7
IRR			52%		240%	39%
Revenue		\$M/yr	46	46	32	10
Cash Flow (Pre/tax)		\$M/yr	17.19	19.08	14	1.2
Maximum Negative Cash		\$M	-32.41		-5.5	
Assumptions						
Metal Prices		\$US/t Ni	8950	8,950	8,950	8,950
Exchange Rate		\$US/\$A	0.66	0.66	0.66	0.66
		\$A/t Ni	13,561	13,561	13,561	13,561
Mineable		tonnes	3916352.00	3,916,352	3,916,352	3,916,352
		Grade % Ni	1.4	1.4	1.4	1.4
Throughput (average)		tns/yr	391,635	391,635	391,635	391,635
Grade (Yr 1 & 2)		% Ni	1.6	1.6	1.6	1.6
Grade (Yr 2 & 3)		%Ni	1.5	1.5	1.5	1.5
Metallurgical Rec		% Ni	86.10	86.2	86	86
Production (Steady State)		Ni Tns/yr	4824	4,860	4,860	4,860
Operating Costs (inc sustaining capital)			\$/tn	\$/tn	\$/tn	\$/tn
Mining & Geology			28.34	28.28	28.28	
Transport to Remote Mill				6.62	6.62	
Processing			20.49	21.59		21.6
Admin & Environmental			4.63	3.60	3.6	
SalesCo Admin				0.49		
Royalty			8.15	8.28		
Total Site Op Costs			61.60	68.86	38.5	21.6
Capital (Pre Production)		\$M	29.82		4.83	
		\$/tonne	7.61		1.23	
Capital Total		\$M	61.91		33.35	
		\$/tonne Ore	15.81		8.52	
Total All Costs inc Capital			77.41		48.2	
Total Mine Capital		\$M	28.51		28.72	
		\$/tonne Ore	7.28		7.33	
Total Mining Cost (Op + Cap)			35.62		35.61	
Smelter Charges		\$/tn Ore	32.71	33.54		
		\$/US/lb Ni	0.87	0.87		
Trans to Port & Shipping		\$/tn Conc	84.43	81.61		
		\$/tn Ore	5.08	5.21		

14.2.1 Mineral Resources

The mineral resources are as summarised in Section 4 – Geology.

Total Resources amount to 4.1 million tonnes at 1.5% Ni at a 1% Ni cut-off.

At 0.7% Ni cut-off a higher tonnage of 5.4 Million tonnes at 1.1% Ni is available.

From these numbers a mineable tonnage of approx 3.9 million tonnes at an average grade of 1.4% Ni has been estimated. This average grade represents approximately 10% dilution at a 0.7% Ni dilution grade. There is a wide zone of mineralisation between the 0 to 1% Ni cut-off, and observations of the grade within this zone indicate that a 0.7% grade is appropriate.

The presence of higher grade resources near the top of the deposit (Table 14.4) allows higher grade production, particularly in the initial years. This has been assumed in the model.

Table 14.4 - Higher Grade Zones

Ore Zones	Resource Tonnes	Grade % Ni	Cut Off % Ni	Contained Metal Tonnes Ni
North Avebury	630,000	2.0	1.3	12,600
Viking (South Avebury)	630,000	2.0	1.6	12,600
Total	1,260,000	2.0		25,200

14.2.2 Metal Prices and Exchange Rates

Metal Prices

At the time of writing, nickel price forecasts are generally appear on the bullish side with many forecasting periods of higher prices. For the purposes of this analysis the “Commonwealth Bank” August 2003 forecast of a Ni price of US\$ 8950/tonne for September 2003 has been adopted this equates to a US\$4.06/lb Ni. The current price August 03 is US\$4.40/lb.

Exchange Rate

As discussed with Allegiance representatives the current exchange rate, A\$/US\$ = 0.66, has been adopted for the purpose of this study.

14.2.3 Metallurgy, Smelter Charges and Penalties

Information provided by Allegiance indicates that based on preliminary tests it may be possible to achieve a 22% nickel concentrate at an 86.2% nickel recovery for a head grade of 1.4% Ni. This has been adopted in the analysis.

The recovery depends on the head grade and concentrate grade. Preliminary analysis indicates that the higher grade 22% Ni concentrate is preferred to say a lower grade 20%, even though a approximately 1% recovery increase is achieved for the lower grade concentrate.

A number of smelters were approached for indicative terms for the Avebury concentrate from these a payment and treatment scenario has been adopted. Indicative payment terms are based on “accountable metals” in the case of the Avebury concentrates accountable metals are:

	%
Ni	93
Co	50

In addition to the Ni payment, a payment is also applicable for cobalt and at \$US6/lb Co this amounts to \$US34/tonne of concentrate.

Indicative treatment charges are approximately US\$150 per tonne of dry concentrate combined with refining charges of \$US 0.50 per lb of accountable Nickel and US\$1.60 per lb of accountable Cobalt.

Arsenic is present in the ore and at this stage it is not possible to accurately predict the arsenic content in the concentrate. Therefore it is not possible to reliably determine if an arsenic penalty is applicable, and/or what the extent of such a penalty would be.

Indicative terms, supplied by a potential smelter, indicate that Arsenic is below maximum acceptable levels and it appears the Avebury concentrate may not incur any significant arsenic penalty. This will need to be confirmed with detail metallurgical studies and finalised smelter terms. A small penalty of less than \$US10/tonne for MgO is likely.

It is believed that the high grade of the concentrate (22%) makes the product attractive to smelters.

14.2.4 Concentrate Transport and Freight

Concentrate transport, port charges and shipping have been estimated based on historic West Coast costs and compared to a quoted option of \$25/tonne plus a 3% smelter revenue deduction. Both options are similar and result in a cost of around \$82 per wet metric tonne of concentrate. Included in these costs is a shipping charge of \$US32/tonne.

14.2.5 Capital Costs

The total initial capital cost estimate (including pre-production capital) for the two options are summarised in Table 14.5 below. Capital beyond pre-production, ie sustaining capital for the life of the mine, is incorporated into cashflow estimates.

Due to timing issues re pre production, the totals below are slightly different to that shown in the financial summary.

Table 14.5 – Summary Capital Expenditure

Capital Expenditure - Mill at Site		Mill at Renison	
	Total		Total
Stage 1 - Exploration Decline and Set Up Costs			
Access and Portal Development	500,000		500,000
Infrastructure	200,000		200,000
Offices	65,000		65,000
Portal Facilities	700,000		700,000
Power	186,000		186,000
Supervision & Op			
Decline Development	3,497,549		3,497,549
Technical Studies			
Resource/Reserve Drilling	830,000		830,000
Geology & Mining Studies	150,000		150,000
Metallurgical Studies	150,000		150,000
Environmental Management Plan	150,000		150,000
DPEMP	150,000		150,000
Final Feasibility Study	350,000		350,000
Management Costs	400,000		400,000
Total Stage 1	7,328,549		7,328,549
Mill, Equipment and Infrastructure Costs			
Financing Costs	500,000		400,000
Mill	24,000,000		
Infrastructure			
Main Road Upgrade	500,000		800,000
Other	60,000		30,000
Management	199,700		49,700
Mining Equipment	250,000		750,000
Mill and Infrastructure Costs	25,509,700		2,029,700
Development Costs - Pre Prod			
Decline			467,500
Main Rises - Vent & Escape	467,500		174,000
Level Development Waste	54,000		1,604,656
Mine Supervision & Geology	1,083,878		1,366,000
Ore Development - Pre Prod	2,706,000		226,073
Ore Transport to Renison			3,838,229
Development Costs less Stage 1	30,288,578		5,639,085

Stage 1

Stage 1 Capital Costs for Access Roads, Power Supply, Exploratory Decline Access, Bulk Sample, Feasibility Studies, and Reserve/Resource Drilling are discussed earlier and extracted from the “Avebury Business Plan”. They amount to approx. \$7.3 million. Stage 1 capital is common to both options and is considered separately to the other parts of the project.

Mill at Site Option

The mill capital cost, is based on the cost of similar projects and information discussed in previous chapters. A cost of \$24million for a 0.4 million tonne per annum plant has been estimated, by Allegiance, and used in this study.

It is assumed that mining contractors, who will provide all equipment, services and manpower, will carry out the underground development amounting to approximately \$3.5 million in the pre-production year. Capital costs prior to start-up but do not include the purchase of any mobile underground equipment but the mine will provide surface infrastructure and underground services equipment such as main fans, main pumps, and electrical substations. This amounts to a total cost of approx.\$1.5 million.

Other Costs are detailed in the Infrastructure Section and amount to \$0.5 million for road upgrades and \$0.2 million for minor items such as security fencing, stores areas etc.

This gives a total pre-production capital cost of \$30 million.

Mill at Renison

In this option the capital cost of the on site mill is avoided but an allowance of \$4 million is made for converting and refurbishing a proportion of the Renison Mill. This cost is indicative only and will be the subject of a detailed engineering estimate. It is not include as an Allegiance cost but a Renison cost.

The large volume of ore transported to the Renison site will require an upgrade of the access road, an allowance of \$1.5 million has been included. Only \$0.8 million has been spent at time of commencing haulage of commissioning ore. Total infrastructure costs are \$2.02 million.

The total capital expenditure for Allegiance for this option is \$5.5 million.

14.2.6 Operating Costs

Mining

Mining costs have been based on unit costs estimated for the particular stoping method chosen. At this stage due to limited geotechnical information it has been decide to base the method on 10 metre wide primary stopes and 21 metre wide secondary stopes (pillars). The primary stope will be filled with cemented fill thus allowing high recoveries of the secondary stopes.

The total stoping cost is estimated at \$28 per tonne and development is \$9 per tonne, giving a total mining cost of \$37 per tonne including the initial pre-start development of the mine. Ore development is expected to yield approximately 20% of the total production ore.

Milling

Costs are based on \$20.5 per tonne for a 0.4 million tonne per annum mill on site, and approx. \$21.5/tonne for milling on site at Renison. The Rension cost is higher as the mill is older and all site administration and ongoing maintenance/capital replacement costs are included. There is a consequent reduction of administration costs at Avebury.

Administration & Other

Avebury administration and environmental costs are estimated at \$4.8 per tonne for the mill at site option and \$3.6 per tonne for milling at Renison option.

14.3 Economic Models

The following tables 14.6 to 14.9 summaries the “Mill at Site” and “Mill at Renison” options.

As a matter of interest another set of tables have been included for a Mill on Site Option at a higher metal price and higher throughput.

The higher metal price, US\$12,000/t, has been suggested by some pundits, see Appendix B. Whilst there is obviously no guarantee of such prices it is interesting to see the effect of such an increase, with a constant A\$ at 0.66.

In the same scenario an increase in Mill through put has been modelled. The throughput has been increased from 400,000 to 600,000 tpa however this would require an increase in resource of approx. 50% to enable a 10 year mine life. In this case there has been no provision for increased capital expenditure to allow for mill or expansion and the figure in the table must be considered in this context.

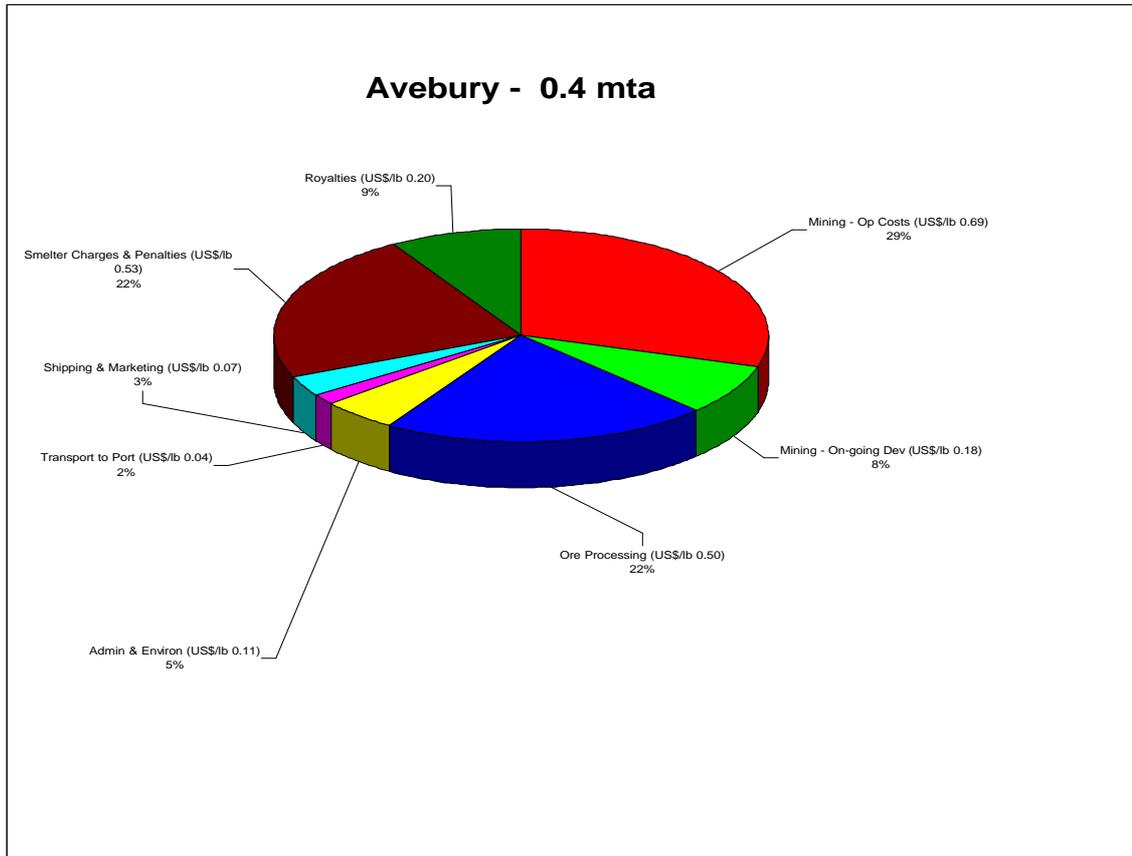
The Tables 14.10 and 14.11, summarise these options.

Table14.12 shows all costs on a US \$/lb basis, whilst Figure 14.1 shows a graphical representation of this information.

Table 14.12 – Costs/lb

	US\$/lb Ni	A\$/lb Ni
Mining - Op Costs (US\$/lb 0.69)	0.69	1.04
Mining - On-going Dev (US\$/lb 0.18)	0.18	0.27
Ore Processing (US\$/lb 0.50)	0.50	0.75
Admin & Environ (US\$/lb 0.11)	0.11	0.17
Site subtotal	1.48	2.24
Transport to Port (US\$/lb 0.04)	0.04	0.06
Shipping & Marketing (US\$/lb 0.07)	0.07	0.11
Smelter Charges & Penalties (US\$/lb 0.53)	0.53	0.80
Royalties (US\$/lb 0.20)	0.20	0.30
Ex site subtotal	0.84	1.27
Total	2.31	3.50

Figure 14.1 – Diagrammatic View of Costs/lb



Economic Summary – Mill at Renison

Table 14.6 - Production and Revenue Summary

Avebury Nickel Project - Summary Mill at Renison			2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Production and Revenue														
Mine Production														
Avebury	- tonnes		316350	400002	400000	400000	400000	400000	400000	400000	400000	400000	400000	400000
	% Ni		1.70	1.51	1.42	1.43	1.20	1.20	1.74	1.34	1.44	1.50		
Mill Production														
Avebury	Mill Feed - Tonnes		273331	400000	443021	400000	400000	400000	400000	400000	400000	400000	400000	400000
	Grade %Ni		1.70	1.51	1.42	1.43	1.20	1.20	1.74	1.34	1.44	1.50		
Metallurgy	Recovery %		86.16	86.20	86.20	86.20	86.20	86.20	86.20	86.20	86.20	86.20	86.20	86.20
	Conc Grade %		22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
	Tonnes		18,214	23,653	24,649	22,412	18,807	18,807	27,271	21,001	22,569	23,509		
	Grade %		22.00	22	22	22	22	22	22	22	22	22	22	
	Metal Units Ni (tonnes)		4,007	5,204	5,423	4,931	4,138	4,138	6,000	4,620	4,965	5,172		
Revenue Statement														
	Nickel Price (Nominal) US \$/tonne		8950	8950	8950	8950	8950	8950	8950	8950	8950	8950	8950	8950
	ER \$US/\$A		0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
			A \$M											
	Revenue (Ex Smelter)		30.48	53.09	54.98	49.99	41.95	41.95	60.83	46.84	50.34	52.44		
	Price Premium													
	Transport, Storage and Shipping		-1.60	-2.08	-2.17	-1.97	-1.66	-1.66	-2.40	-1.85	-1.99	-2.07		
	Revenue A\$M		28.88	51.00	52.81	48.01	40.29	40.29	58.42	44.99	48.35	50.36		

Economic Summary – Mill at Renison

Table 14.7 - Cash Flow Statement

Avebury Nickel Project - Summary Mill at Renison		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014		
Cash Flow Statement		A \$M											
Revenue	Revenue Total	28.88	51.00	52.81	48.01	40.29	40.29	58.42	44.99	48.35	50.36		
	Mine Revenue	28.88	51.00	52.81	48.01	40.29	40.29	58.42	44.99	48.35	50.36		
Operating Costs													
	Mining cash cost	9.39	13.08	11.55	11.73	11.67	11.94	11.92	10.29	9.60	9.60		
	Transport to Remote Mill	2.09	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65		
	Ore Treatment (Renison)	8.05	8.40	9.30	8.40	8.40	8.40	8.40	8.40	8.40	8.40		
	Mine Admin (SalesCo)	0.38	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50		
	Mine Administration & Other	0.52	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70		
	Environmental	0.56	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75		
	Total Royalty	2.02	3.57	3.70	3.36	2.82	2.82	4.09	3.15	3.38	3.53		
Total costs		23.01	29.64	29.15	28.08	27.49	27.75	29.00	26.43	25.98	26.12		
Revenue Less Operating Costs		5.86	21.36	23.66	19.93	12.81	12.54	29.42	18.56	22.37	24.25		
Less:	Working Capital Movements												
Surplus From Operating		5.86	21.36	23.66	19.93	12.81	12.54	29.42	18.56	22.37	24.25		
Less:	Capital Expenditure	0.10	5.36	6.09	2.98	5.20	3.84	3.70	2.25	1.47	1.42		
	Tax Payable Annually in Arrears												
Net Cash Flows	133%	-0.10	-5.36	-0.23	18.37	18.46	16.09	9.10	8.94	27.17	17.09	20.95	22.85
Cumulative Cash Flows		-0.10	-5.46	-5.69	12.68	31.14	47.23	56.33	65.27	92.44	109.54	130.49	153.34
		-0.10	-5.36	-0.23	18.37	18.46	16.09	9.10	8.94	27.17	17.09	20.95	22.85

Economic Summary – Mill at Site

Table 14.8 – Production and Revenue Summary

Avebury Project - Nickel			2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production and Revenue															
Mine Production															
Avebury	- tonnes					316350	400002	400000	400000	400000	400000	400000	400000	400000	400000
	% Ni					1.72	1.51	1.42	1.43	1.20	1.20	1.74	1.34	1.44	1.42
Mill Production															
Avebury	Mill Feed - Tonnes					239998	400000	476354	400000	400000	400000	400000	400000	400000	400000
	Grade %Ni					1.72	1.51	1.42	1.43	1.20	1.20	1.74	1.34	1.44	1.42
Metallurgy	Recovery %					85.40	86.20	86.20	86.20	86.20	86.20	86.20	86.20	86.20	86.20
	Conc Grade % Ni					21.73	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
Concentrate	Tonnes					16258	23653	26503	22334	18807	18807	27271	21001	22569	22255
	Grade % Ni					22	22	22	22	22	22	22	22	22	22
	% Co					0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
	Contained Metal Units Ni (tonnes)					3533	5204	5831	4913	4138	4138	6000	4620	4965	4896
Revenue Statement															
	Nickel Price US \$/tonne					8950	8950	8950	8950	8950	8950	8950	8950	8950	8950
	Cobalt Price US \$/lb Co					6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
	ER \$US/\$A					0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
						A \$M									
	Revenue Ni + Co (Ex Smelter)					21.90	53.62	59.11	49.81	41.95	41.95	60.83	46.84	50.34	49.64
	Less														
	Transport, Storage, Shipping & Insurance					1.21	2.36	2.41	2.03	1.71	1.71	2.48	1.91	2.05	2.03
	Revenue A\$M					20.69	51.26	56.70	47.78	40.24	40.24	58.34	44.93	48.28	47.61

Economic Summary – Mill at Site

Table 14.9 – Cash Flow Statement

Avebury Project - Nickel		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cash Flow Statement				A \$M										
Revenue	Revenue Total				20.69	51.26	56.70	47.78	40.24	40.24	58.34	44.93	48.28	47.61
	Mine Revenue				20.69	51.26	56.70	47.78	40.24	40.24	58.34	44.93	48.28	47.61
Operating Costs														
	Mining cash cost				6.74	13.43	11.86	11.74	11.80	11.95	12.33	11.64	10.55	8.95
	Transport to Remote Mill													
	Ore Treatment				6.00	8.70	9.53	8.00	8.00	8.00	8.00	8.00	8.00	8.00
	Mine Administration & Other				0.58	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
	Environmental				0.38	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	Total Royalty				1.45	3.59	3.97	3.34	2.82	2.82	4.08	3.15	3.38	3.33
Total costs					15.14	27.63	27.26	24.99	24.52	24.67	26.32	24.69	23.84	22.19
Revenue Less Operating Costs					5.55	23.64	29.44	22.79	15.71	15.56	32.02	20.24	24.45	25.43
Less:	Working Capital Movements													
Surplus From Operating					5.55	23.64	29.44	22.79	15.71	15.56	32.02	20.24	24.45	25.43
Less:	Capital Expenditure	0.00	0.10	18.85	12.19	3.79	7.29	5.90	5.77	4.35	2.12	1.07	0.47	0.00
	Tax Payable Annually in Arrears													
Net Cash Flows	52%	0.00	-0.10	-18.85	-6.64	19.85	22.14	16.89	9.94	11.22	29.91	19.17	23.97	25.43
Cumulative Cash Flows		0.00	-0.10	-18.95	-25.59	-5.74	16.40	33.29	43.23	54.44	84.35	103.52	127.50	152.92

Economic Summary – Mill at Site, \$US 12,000/t, 600,000 tpa

Table 14.10 – Production and Revenue Summary

Avebury Project - Nickel			2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production and Revenue															
Mine Production															
Avebury	- tonnes					316350	400002	600000	600000	600000	600000	600000	600000	600000	600000
	% Ni					1.72	1.51	1.42	1.43	1.20	1.20	1.74	1.34	1.44	1.42
Mill Production															
Avebury	Mill Feed - Tonnes					239998	400000	476354	600000	600000	600000	600000	600000	600000	600000
	Grade %Ni					1.72	1.51	1.42	1.43	1.20	1.20	1.74	1.34	1.44	1.42
Metallurgy	Recovery %					85.40	86.20	86.20	86.20	86.20	86.20	86.20	86.20	86.20	86.20
	Conc Grade % Ni					21.73	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
Concentrate	Tonnes					16258	23653	26503	33500	28211	28211	40906	31502	33853	33383
	Grade % Ni					22	22	22	22	22	22	22	22	22	22
	% Co					0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
	Contained Metal Units Ni (tonnes)					3533	5204	5831	7370	6206	6206	8999	6930	7448	7344
Revenue Statement															
	Nickel Price US \$/tonne					12000	12000	12000	12000	12000	12000	12000	12000	12000	12000
	Cobalt Price US \$/lb Co					6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
	ER \$US/\$A					0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
				A \$M	A \$M	A \$M	A \$M	A \$M	A \$M	A \$M	A \$M	A \$M	A \$M	A \$M	A \$M
	Revenue Ni + Co (Ex Smelter)					31.20	76.35	84.17	106.40	89.60	89.60	129.91	100.05	107.52	106.02
	Less														
	Transport, Storage, Shipping & Insurance					1.27	2.51	2.53	3.19	2.69	2.69	3.90	3.00	3.23	3.18
	Revenue A\$M					29.94	73.83	81.65	103.20	86.91	86.91	126.02	97.05	104.29	102.84

Economic Summary – Mill at Site, \$US 12,000/t, 600,000 tpa

Table 14.11 – Cash Flow Statement

Avebury Project - Nickel		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Cash Flow Statement				A \$M											
Revenue	Revenue Total				29.94	73.83	81.65	103.20	86.91	86.91	126.02	97.05	104.29	102.84	
	Mine Revenue				29.94	73.83	81.65	103.20	86.91	86.91	126.02	97.05	104.29	102.84	
Operating Costs															
	Mining cash cost				6.74	13.43	15.45	15.37	15.47	15.66	16.07	15.02	13.94	11.93	
	Transport to Remote Mill														
	Ore Treatment				6.00	8.70	14.29	12.00	12.00	12.00	12.00	12.00	12.00	12.00	
	Mine Administration & Other				0.58	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	
	Environmental				0.38	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	
	Total Royalty				2.10	5.17	5.72	7.22	6.08	6.08	8.82	6.79	7.30	7.20	
Total costs					15.79	29.21	37.36	36.50	35.46	35.65	38.80	35.72	35.14	33.04	
Revenue Less Operating Costs					14.15	44.63	44.29	66.71	51.45	51.26	87.21	61.32	69.15	69.80	
Less:	Working Capital Movements														
Surplus From Operating					14.15	44.63	44.29	66.71	51.45	51.26	87.21	61.32	69.15	69.80	
Less:	Capital Expenditure	0.00	0.10	18.85	12.19	3.79	7.29	5.90	5.77	4.35	2.12	1.07	0.47	0.00	
	Tax Payable Annually in Arrears														
Net Cash Flows		112%	0.00	-0.10	-18.85	1.96	40.84	36.99	60.80	45.68	46.91	85.10	60.25	68.67	69.80
Cumulative Cash Flows			0.00	-0.10	-18.95	-16.99	23.85	60.84	121.65	167.33	214.24	299.34	359.59	428.27	498.07

15.0 SUMMARY OF ASSUMPTIONS

Key Assumptions are:-

15.1 Geology

- Allegiance has tenure over all lease areas.
- Total Resources 4,060,000 t @ 1.5%Ni.
- Viking cut off, 1.0% Ni (provided by M. McKeown)
- Nth Avebury cut off, 0.8% Ni (provided by M. McKeown)
- Stage 1 Capital Infrastructure provided in conjunction with Newnham Exploration Services.

15.2 Stage 1, Exploration Decline

- Stage 1 development by contractors
- Stage 1 development costs at approx. \$2,600/m advance
- Total Stage – M\$7.3

15.3 Mining

- Life of mine development and stoping by contractors
- Geotechnical information derived from decline geotechnical hole and estimates from A.J. Bruce "Avebury Prospect Mine Scoping Study 2000".
- Max back width approx. 7m. Max wall span 20m x 25m.
- Power costs at \$0.06/kWhr.
- Mine operating costs approx. \$27/tonne.
- Mine Capital Development costs approx. \$5/t.
- Mining recovery approx 85%.
- Mine Dilution 10%
- Diluant Grade 0.7% Ni
- Mill Feed Grade 1.4% Ni.

15.4 Milling

- Capital Cost of Mill M\$24
- Operating Cost of Mill \$21/t.
- Mill recovery 86%.
- Conc grade 21.5%
- Arsenic 0.47%
- (No arsenic penalty at smelter. Confirmed via letter from smelter)

15.5 Financial

- Mine Life approx. 10 years
- Base Nickel price US\$8,950/t
- A\$:US \$ 0.66

16.0 REFERENCES

- 1 **Newnham Exploration and Mining Services**, "Avebury Nickel Project Scoping Study", 2001.
- 2 **Viking Decline Development**, Avebury Nickel Project, Stage 1, Development Proposal and Environmental Management Plan (DPEMP).
- 3 **BFP Consultants Pty Ltd**, "Avebury Nickel Project Stage 1 – Viking Decline Development Business Plan", May 2003.
- 4 **Allegiance Mining NL**, Avebury Nickel Project – Mineral Resource Report November 2002 by Michael McKeown.
- 5 **AJ Bruce Consulting Pty Ltd**, "Avebury Prospect – Mine Scoping Study", December 2000.
- 6 **Metcon Laboratories Pty Limited**, "Avebury Nickel Project Metallurgical Scoping Study for Allegiance Mining N.L.", December 2000.
- 7 **John E Butler**, "Avebury Nickel Project Metallurgical Scoping Study for Allegiance Mining N.L.", December 2000.
- 8 **Western Metals Limited**, "Preliminary Flotation Test Results – Avebury Nickel Sulphide Project Drill Hole A026A", May 2003.
- 9 **Devlure Pty Ltd**, "Conceptual Metallurgical Studies – Nickel Ore Processing Tasmania", August 2003.

APPENDIX 1

ALLEGIANCE MINING N.L.
AVEBURY Mine Scoping Study

A J BRUCE CONSULTING PTY LTD
ABN 11 085 961 977

	BENCHES			OPEN STOPES		
	Footwall	Backs	Hangingwall	Footwall	Backs	Hangingwall
Top RL		2050			2050	
Bottom RL		1800			1920	
Surface RL		2190			2190	
Average Depth		265			205	
σ_v		7.2			5.5	
σ_1		21.5			16.6	
Stress factors	0.6	1.3	0.6	0.5	1.5	0.5
σ Max	13	27	13	8	24	8
Average UCS	34	34	78	34	34	78
UCS/ σ max	2.6	1.3	6.1	4.1	1.4	9.4
Q'	3.0	3.0	6.0	3.0	3.0	4.0
A	0.3	0.1	0.6	0.4	0.1	0.9
B	0.3	1.0	0.3	0.3	1.0	0.3
C	4.0	2.0	6.0	6.0	2.0	4.0
N	1.1	0.6	6.5	1.9	0.6	4.3
Supported	Yes	Yes	Sill only	Yes	Yes	Sill only
>> S	4.5	3.0	5.0	7.0	4.0	5.0
Actual Stope Height/Width	22.5	10.0	18.0	20.5	7.0	20.5
Notes:	Floor to floor plus sill height	Desirable silling width after stripping	Excludes cabled sill hanging wall	Excludes cabled sill foot wall	Drive width only	Excludes cabled sill hanging wall
Stable Length*	15	15	23	44	Infinite	20
Typical RQD	85	85	90	80	80	85
Typical Jn	9	9	4	9	9	4
(RQD/Jn)/s	1.9	2.1		1.5	1.5	
Use Design Width/Height	22.5	10.0		20.0	26.0	
Use Design Length	18	100		30	22	
Actual S	5.0	4.5		6.0	6.0	
Entry	No	Yes		No	Remote loader	
Cable Density	0.1-0.15	0.25-0.35	NA	0.15-0.3	0.18-0.32	NA

* Note:

The stable stope size for benches was calculated as the average of the stable hangingwall and footwall lengths i.e. $(15+23)/2 = 19$ metres. Stope length used was 18 metres.

Maximum open stope dimension was calculated as the average of the stable hangingwall and footwall lengths i.e. $(44+20)/2 = 32$ metres. Max stope dimension used was 30 metres.

Q' , RQD and Jn were derived from the histogram calculations on the "Q Index Calcs_1" tables in this Appendix (Appendix C).

A J Bruce Consulting Pty. Ltd.
A.C.N. 085 961 977
Telephone: (03) 63347080
Facsimile: (03) 63347079
E-mail: ajbruce@bigpond.com
P.O. Box 1170 Launceston Tas. 7250

APPENDIX 2



[Home](#) [Tenders](#) [Events](#) [Advertise](#) [Subscribe](#) [Contact Us](#) [About Us](#)

Wednesday



User Info

[Click here to login](#)



Related Links

Section

[Investment News](#)
[General](#)

Region

[All Regions](#)

Commodity

[Nickel News](#)

Other



[Printable Version](#)



[Send to a Friend](#)



Search Archives

Type Text Here

Section

Commodity

Region



Company Search

Type Text Here

Today's News

[Deutsche Bank puts 'sell' on Rio Tinto](#)

[Mount Burgess picks up ex-Billiton ground](#)

[DRD strikes wages](#)

Nickel seen headed towards US\$12,000/t

Monday, August 18, 2003

THE world nickel market is said to be close to the crisis expected when workers at Inco's Sudbury plant in Canada walked off the job 12 weeks ago, with predictions that stocks are approaching a critical level and a nickel price of US\$12,000 a tonne is possible.

Stephen Briggs, a metals analyst at Socgen in London, was quoted by *Reuters* as saying that "with a nickel matte deficit forecast for next year and probably an even bigger one thereafter, there is some kind of crisis brewing".

London Metal Exchange stocks are reported to have reached 17,000 tonnes, their lowest level for two years and down from 26,500 tonnes when the Inco strike started.

Jim Lennon from the London office of Macquarie Equities said, "I can see circumstances where LME stocks go down to zero and US\$12,000 a tonne is not out of the realms of possibility".

"Already this year there is a 50,000 tonne nickel deficit on a global basis, but the 60,000 tonnes from Norilsk offset that," he told *Reuters*.

"Next year there will be another 50,000 tonne deficit but there will be nothing to offset it," Lennon said.

[Click here to read the rest of todays news stories.](#)

